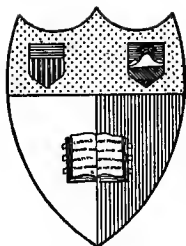


The “Conscious Cross-Section”

R. C. GIVLER



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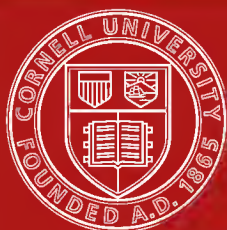
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THE "CONSCIOUS CROSS-SECTION"

A Realistic Psychology

BY

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DEDICATED
TO ALL THOSE NOT YET BEDEVILED
BY THE DOCTRINE
OF
HARD ATOMS AND SOFT SOULS,—
BUT WRITTEN
FOR THE OTHERS

INTRODUCTION

Memories of Aristotle, together with the latest popular information about the nerves, make up the bulk of the usual text-books in psychology. Faculty psychology is still with us, however much we may have renounced it in our sane and critical moments; our language flows on by momentum as it did of yore, and the old nouns still call seductively. For in the midst of our revolt against substantialism, we know not yet how to speak in a constructive manner. I am convinced that no pussy-foot departures from this type of psychology will render adequate service to the matter involved, and I mean, furthermore, that these pages shall bear witness of that conviction. Even in some of the better universities of this country there is a great discrepancy between the psychology verbally taught in the lectures, and that which the student reads in the assigned references. Even the usual book on the subject is a popular phrasing of the enjoyable lecture material of the author's previous years, and not that psychology which represents the best of his present estimate of the subject. The ways of men

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seem to be so incurably pragmatic, that it is dangerous to publish the untried.

I offer this outline of a realistic program for psychology as something but partly tried. By realistic I mean that mind is treated as something observable, something mentionable in all of its phases, as well as in its last analysis. There will not be urged any *non possumus intellegere* at the close of the book, however many special matters must be left untouched for lack of space. The claim here made is that mind, soul, thought, consciousness, and all other terms referring to personality, are in no need of being interpreted by way of Paddock, but rather that they mean things which can be discussed and understood by any one so disposed. Psychology is a natural science,—that is, it requires no concept of trans-empirical things to deal with it exhaustively. This will heartily displease a host of readers, and those who “imagine there must be the indefinite *something* in the mysterious *all this*” will not be enthusiastic about the ideas hereinafter to be presented.

There are two ever-recurring items in this book to which signal attention may be called. The one is the special form of analysis used, and the other is the continual reference to deep-seated errors in popular psychology. For both

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of these characteristic attitudes I am glad to acknowledge my indebtedness to Professor Edwin B. Holt, of Harvard University. His "Concept of Consciousness," from which I have unsparingly quoted in these pages, may be said to have furnished the foundation upon which this whole structure has been laid. The title of this book itself is one of his keenest phrases. I am not sure that he will acknowledge the whole program employed herein as deducible from realistic premises, but I feel sure that many common parts exist between his exposition of realism and mine.

Either logic or flapdoodle. This is the thesis defended in this book with regard to the analysis of mind. If one is to speak at all about any matter, let him first of all be clear and definitive. Fusion and synthesis come fast enough to undo the work of separating things into their elements for the sake of a clear comprehension of them. For the business of speaking in general about matters that are particular is not only avoiding the issue, but it is even a tacit attempt to traduce the factual status of the terms involved. In following this scheme, the student will find a bit of difficult reading here and there. Nevertheless, the ultimate grounds of logic are not only what every vigorous stu-

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dent deserves to know, but that which he straightway asks to have exhibited to him as well. This method may be altogether too ambitious, but if logical treatment cannot be employed in psychology, we had better not talk of a science of human consciousness.

For the general polemical tone of this book no apology would be sincere. Students come into psychology with all sorts of quaint notions about themselves, which only a wholesale, immediate house-cleaning will suffice to eliminate. Nothing is of so much benefit to a man as to realize once in a while that he has been going by momentum rather than by initiative, and a course in psychology is scarcely beneficial if it does not pluck one clean from his worst ruts. In fact, the writing of this book is designed to stimulate to that end rather than to perpetuate drowsiness. The reader is hereby assured that all of the notions combated in these pages are combated in a manner specifically meant. As is well known, realists do not usually have the reputation of apologizing for their directness, and if they are wrong, no one need hesitatingly whisper back the verdict of error.

As a last special item to be mentioned, this book is not a behavioristic psychology, however much the words "organism" and "function" may

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appear in it. As I understand it, behaviorism is a theory of the criteria of mind, and not a system that can be substituted for psychology. It is rather a thesis defending the notion of continuity in the animal kingdom,—something, to be sure, no realist would sanely controvert,—and upon inspection, its chief motive turns out to be an animism with the “anima” left out. It is not an exhaustive study of even the behaviors of the organisms whose tropisms it records. This book is a realistic program for psychology and thereby holds that the environment is always to be kept in view along with whatever the organism may be internally or externally accomplishing upon it.

Not all has been accomplished, however, that was in the original plan. As a text-book it is full of gaps. But, inasmuch as it was written solely for use in my own classes, and is to be supplemented by lectures to fill in these gaps, only the general plan is offered for criticism to the general reader. Few signally acute experiments have been cited, and those are representative rather than exhaustive reckonings with the data involved. The empirical status of mind is the central item of this book, as well as the continual warnings against mysticism

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and sentimentality in regard to the science of psychology.

The bibliography included in this book has been devised for elementary students who do not readily read French or German. It contains but few references, and these few are selected with a view to supporting rather than inhibiting the theses contained in the text.

In the preparation of this book for the press I have been assisted in various ways by those to whom this public thanks is due. To my colleague, Dr. E. R. Guthrie, I am indebted for very helpful hints as to some of the logical matters involved in the first two chapters; to Margaret Givler, for a thorough inspection and criticism of the text in point of diction and rhetoric; and to Mr. William R. Wilson, of the University of Washington, for assistance in proof-reading as well as for suggestions as to clarity of expression from the student's standpoint.

Seattle, Aug. 1, 1915.

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THE "CONSCIOUS CROSS-SECTION"

CHAPTER I.

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1. There are two fallacies, either of which usually bothers the tyro in psychology: the first is, that since everybody has a mind, each one on that account knows more than any one else can know about his own mind; and the other is, that mind, being that unique and most intricate thing in the whole universe, contains something so elusive and mysterious that it can never be fully known.

2. The first thing to do is to surmount both of these statements so that they will not plague us any longer. They are both samples of reasoning by analogy, rather than reasoning from principles concerning which there is no room for quibbling. If a thing can be disproven by the same sort of reasoning by which it was proven, it cannot be sound. We shall, then, first disprove them by analogical reasoning, and later on, by another and better kind, so that they will be permanently surmounted. Now, everybody not only has a mind, but a deceased ancestor, a mesentery, and at an early

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age, a future. But who would claim to know his own deceased ancestor as well as some one else might have known him, or that the healthy or diseased state of his own mesentery were as plainly before him as the news of to-day's paper? Nor, again, can it be maintained that one necessarily knows his own future or what its development will be as well as those who, having followed his family history, might safely predict after watching his habit formations ripen into maturity beyond voluntary recall. This shows sufficiently the purely verbal character of the first fallacy in the preceding paragraph.

3. For the second one, a similar treatment will suffice. The mysterious element in mind is said to stand in the way of a scientific psychology, inasmuch as mystery is a word usually employed to indicate an inherent property of things *not yet known*. But, besides this, there is no reason why one should reserve his mysteries until the last chapter of psychology, rather than plant them squarely at the beginning, or why that part of psychology which is open to investigation must therefore be pestered by some beetling mystery which comes ominously near and provokingly soon. To carry this fallacious argument to its limits, one

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would be permitted, in solving a mathematical problem, to excuse his errors in calculation on the ground that numbers were pure figments of the imagination anyway, and that *his* imagination was at least as good as that of the early Egyptians.

4. This is, however, only meeting poor arguments with equally poor ones. A fallacy is not merely something that can be laughed off, but in these cases it is something which needs to be surmounted by an appeal to exact principles rather than to the playfulness of words. As soon as one begins an argument, he lays himself open to the perils of argument; it will also be public information whether what goes for proof can withstand all inquiry that is brought to bear upon the statements uttered and defended. The difficulty with these two fallacies is that they contain words which cannot be pressed for their meaning within the total context in which they are embedded; lacking the form of clear-cut statements, they cannot be pressed for conclusions. Chaff put into a hopper will not grind into wheat in any mill except the one owned by Grimm and Grimm. Let us carefully show how this is.

5. Every science is a collection of observed facts gathered together under the guidance of

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a permanent interest, plus as many conjectures as to the relationships of these facts to one another as are required to arrange them in a system or to apply them to things of the street. A system is an arrangement of things from simple to complex, fundamental to variable; a pile of rubbish is not a system, while the plans for building a pyramid are. The facts of a science must first be supplied with names, and the significance of the names lies in what the things named will do to one another under certain fixed conditions. So that which was first named by means of a noun, implying substance and fixity, often later on comes to mean what we express by verbs,—valences, chronic instabilities, readiness to affect or be affected by other things. Over the terminology, however, usually not much difficulty seriously arises; our language is not so petrified as to forbid a change of meaning without a change of form. But it is not such a simple matter when one comes to the conjectural part of a science. To formulate the laws of the way things behave, to be sure that one's sampling of behaviors is broad and salient, and to arrange the laws in a logical system,—here in the case of every science there is much difficulty, more disagreement and a maximum of doubt as to what can

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actually be deduced from a system so formed, no matter what the science may be,—Geometry or Ethics.

6. Every science, therefore, might be said to have two sides,—one of observation and the other of logic. We perceive well enough, perhaps, what is before us, but we cannot speak well enough to cover the facts or to convince the audience. To offset this as much as possible, every science reducible to exact terminology and quantification is phrased in symbols peculiarly specific and univocal in character. Words of many meanings will not do. It thus uses expressions which are defined, or limited in scope which cover precisely the data involved and have the same, rather than a different meaning to every one more or less concerned. One beginning the study of such a science often is disappointed at finding himself in the dark in regard to the thing to be studied,—he had thought that it was to have much more connection with his daily, pressing needs. The reason for this is that those who have developed the science had first themselves to unlearn the current, metaphorical, inexact speech in order to make any headway in it. To command nature, they found they had first to obey

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it, and so the lesser good had been butchered without a public ceremony of apology.

7. Thus every science aims to be symbolical and univocal in its terminology. However, in psychology, one can hardly ever be said to be clear of that realm of discourse where the private interpretation of a word may not interrupt all attempts at deductive formulation. Almost every statement can be challenged, almost every fact be named in several fairly satisfactory ways. But this by no means relegates it to the realm of clannish prejudice. For when a fact has the possibility of being named in many ways, it means only one thing,—that it is no simple, single fact that is before one. One must then look to his terminology to see how much and in what essentials his names for facts have differences irreconcilable with straightforward deductive formulation. Everything is equally a matter of fact, and no datum has any special privileges. If one's logic cannot take care of this or that sufficient statement, it is time for logic to be amended to fit a world whose scientific battles it fights.

8. One thing more: no facts have the plastic character which language has. One goes *to* the facts, observes them, analyses and orders them; reconsiders, re-observes and carefully

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names them over again,—if his need for naming comes out of a dominant motive in his endeavors,—and no amount of juggling with the words apart from the facts can alter their status in the universe whose laws they exhibit. Hasty conclusions, private uses, idealistic or theological motives may seem to have the power of twisting out of their orders in the world the brute items of empirical nature, but a little watchfulness will serve to undermine such traducing of things empirical and render again to the Caesar of organized facts the things that are none but his. Even the private realm of one's own thoughts has of late years been obliged to yield to exact statement. Where, too, formal logic was insufficient to show the bearings of private thoughts upon behavior, an informal logic has been used to suit each individual case, thus meeting the unique and "mysterious" upon its own grounds. The growth of abnormal psychology has done much to tear away the mask from the so-called "inner self" and render its crab-like movements painfully visible to any curious passerby.

9. But to the theme. The first two statements of this chapter were called fallacies not only because of their being controvertible by a mere twist of words, but rather because they

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used concepts in a way totally inadequate to their logical significance in psychology. One argues only by means of logic. There are no "psychological" or "moral" or "economic" reasons,—not to say, of course, that psychologists or moralists or economists do not argue. Nothing powerful or superior, however, lies in any special kind of reasoning. All reasons are couched in "the rules of the game of talk," as my colleague, Dr. Ducasse, would say, and have validity only in so far as they conform to that pattern of expression. Other things may provoke belief, or persuade the lazy not to stew any longer in their own juice, but reasoning is like a game of chess,—it has inviolable rules. It has more, since every science is a case of applied logic. The data of science are not invented, but discovered, and certain few things can be done with them and certain others cannot. Only when "dass Lied ist auss," does there come a hankering after any "special" type of reasoning.

10. "Because I have a mind, therefore I should know more about it than any one else,"—were this merely a verbal fallacy, one could easily laugh it down; but it contains a more serious fallacy than that. The expression, "I have a mind," harmless enough in itself, is a

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statement from which nothing can be argued, IF THAT STATEMENT IS THE STARTING POINT. The speaker of it considers himself a psychologist and intends that it shall be valid for psychology. What else could it purport to be? But as formulated, it is an inexact observation, a bit of random thinking that needs to be drawn and quartered rather than employed determinately. It is really a coalescence of two statements, and belongs to the introspective psychology of selfhood rather than to the outspoken formulations of mental life. As a random thought, it exhibits the informal logic of random thinking; but statements meant for the public ear must be couched in the rules of the game of talk. It is not a premiss from which, by itself, anything whatever can be concluded. "Having," in fact, is a derivative of other things,—familiarity, acquisition, constant dealings with, something spoken or spoken of, and the like, and not an original, first-hand matter at all. The other statement,—the one involving the Mystery and tacitly invoking her at the same time,—exhibits several fallacies, which are: (1) that a mystery would not remain a mystery if it were knowable, and (2) that the part depends upon the whole for its existence and significance. It will be seen

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later on in the chapter on psychological analysis that, even if the naming of all the parts of a whole does not appear to exhaust or explain the properties of that whole, it is not due to *thinking*, but to the organization of the parts by an *extra-mental* set of functions, which accounts for the "mysterious" element to a large degree. The first of these statements under discussion is a fallacy, therefore, because it is an inexact formulation. The second, likewise, because it violates a law of the logic of organization.

11. It will be advantageous, then, for the student to approach psychology without any presuppositions. Other assumptions than the aforementioned fallacies may arise in the reader's mind; some of these coming from trivial, others from earnest desires in regard to oneself. Yet hasty formulations are always unwise, and usually, wrong. Psychology is a study of facts, facts not altered by thinking, and only the inability to back off from them as readily as from the facts of the physical sciences is responsible for the popular view of it as being a study of the way one "feels" about things. Only because psychological things make up to so large an extent the tissue of human affairs is one led to infer that the naive expressions of

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popular speech can become the terminology of the science of psychology without alteration in meaning. "Mind," "consciousness," "thought," "emotion" and the like are all terms as familiar to the psychologist as to the man on the street, but the two cannot converse scientifically on the slender basis of this familiarity. Both careful examination and redefinition are essential if understanding is to accompany the use of such words. The need for such careful examination is nowhere so revealed as in cases of naive prediction and reasoning about things mental. In the writings of certain mental healers of today, for example, alliteration is the highest "logical" category; "experience proves" is a shibboleth from another quarter, from persons blissfully ignorant of the fact that *experience* is both a noun and a verb, usually employed in an equivocal sense. "It is unthinkable" asserts a third party, and then he goes on to state just how carefully the "unthinkable" has been thought out. From such pitfalls of expression one needs to be emphatically warned in psychology.

12. Add to that this: there is as yet no complete, univocal terminology in psychology. Modern Logic has evolved a set of symbols which avoid careless interpretation of the pro-

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cesses in that science. The physical sciences, and, to a large extent the biological, also, need not always name their facts by such terms as can be quibbled over by those not initiated. Psychology, however, lying on the topmost froth of things, has never been and can never be, wholly free from the errors of verbalism. If it had radically fashioned its own set terms, and used heiroglyphic symbols to express them, this very fact might be a sign of its incapability to serve that human interest out of which it sprang and whose evolution it seeks to register daily. For while every deductive science is a case of applied logic, and while logic and mathematics are basically one, the universe of science rests not altogether solidly, but rather totters on the mathematical foundations to which we ultimately appeal for proof.

13. For, if one goes to the facts of a science to find out what shall be said about them, and finds there a number of curiously enigmatical things, yes, even "mysterious" things, as one sometimes does, it would be lazy-mindedness and vanity alone which would lead him to call by simple names things which were exceedingly complex. Psychology is full of just such complexities. For example, one starts to investigate a certain phenomenon, say memory; he

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names it by its accustomed name and sets an experiment which has all possible control over the conditions involved. But frequently the simple, first name given to it begins to prove inadequate; it is *not* simple, and the single noun, such as memory, adaptation and so on, will no longer do at all. Together with this, frequently conclusions will be drawn from the fact that simple words seemed to fit together to make conclusions sought for as words usually do, whereas the facts referred to by such words had need of being reinterpreted for use in any other context than the small one determined by the rigid conditions of a single 'experiment. The interests of science were thus curtailed. Clean experimentation, however, cannot be satisfied with such methods. If the simple name first given to the phenomenon is inadequate, or if the control of the conditions of experiment interferes with the free operation of the functions to be investigated, the work is dropped, the experiment reset, and the old categories are discarded. In psychology, as the signal example of a science whose reagents in the laboratory are human beings, one must be prepared for any emergency of this kind. Only a few human beings make good subjects in psychology, and even those must go through a serious and

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long training in accepting the instructions given and keeping even-minded in order to be valuable for the work under investigation. Psychology, as a record from which general statements can be made, is thus a study of the reactions of selected human beings; its data are gathered from persons found fit to accept the conditions of experimentation, and not others. Figuratively, it is an assay of the highest grades of ore. Life is too short to evolve a deductive science of individual meteors. Not to say, however, that with brows uplifted and eyes aloft, psychology neglects those unregenerates who fail to come up to strict laboratory requirements; for this would be both pharisaism in science as well as unfairness to my fellow psychologists. Only this is meant, that to report specifically upon a matter requiring selective attention, selective attenders of such a stripe are the only possible grist. When the erratic are in the majority, we are only experimenting upon erratics and not upon the intended datum set forth.

14. Coupled with the above warnings in the approach to psychology, a little need as well be said about the use of proof and deduction after the data of the science have been correctly named, the experiments cleanly performed,

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and the chief and subsidiary facts arranged in proper order. "This fact proves," it is sometimes said, and about such statements the clans of science divide and dispute. There are cases, of course, where this is true, but one needs to be wary. All the sciences are of two kinds on this score,—those which are altogether deductive and those which are slightly deductive and mostly empirical. Pure mathematics is the only strictly deductive science; all the others are of the latter class.

15. Let us elucidate this difference. Deduction starts with principles, which when involved, produce results and conclusions which are *new* in the sense of not being apparent from the original principles, but are "generated" by the interaction of statements. This does not mean that some stater behind the statements does the generating, but that the empirical properties of a logical statement alone furnish the parts out of which the new formulation is made. For the stater behind the statements is but a mass of unformulated material, which must come out and "lie flat on the brush" before it can be claimed to have the persistent being of generating things. An empirical science, such as geology, on the other hand, first gets principles from observation, and in

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seeking to deduce other principles from them, MUST ALWAYS FIND FACTS OR TERMS which will satisfy the conclusions arrived at. All else is talking in the air. The chemist or the physicist can see how the conclusions of his statements *ought* to reach this or that end, but only the residues in the retort or the pattern of crystallization on the stone shows him what the upshot of his statements should have been. To a larger extent than the physicist or chemist will admit, also, most deduction in his science is just plain memory,—“it will happen again because it has happened before,” sums up much of the claims for deduction in most of the natural sciences. Their power lies in the control of conditions, rather than in the ability of their conclusions to produce the facts in a presto manner.

16. From all this it can be seen that the words “logical” and “factual” are not synonymous. Arguments about any matter may entirely jump the track and evaporate in nonsense. They may, again, run parallel, and, in that amount of a science which survives time, they do. But one needs always to be alert for the fact that will exactly fit his statements as well as for the statement that will exactly fit his facts, facts being rather hard data and not

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to be treated with impugnity. For while any statement derived from logic has a certain validity, and may be satisfied with terms from some sort of trans-experiential realm, unless the terms can be plainly exhibited to all comers, they should form no part of the body of the science.

17. The use of the proper language and the understanding of just how much of the language one uses is pertinent to the matter in hand is so important for psychology, that I shall give on the next few pages samples of speech containing psychological as well as non-psychological material, some of which will be analysed for the student, the remainder being left for him to analyse for himself. At first, of course, he will not be able to see the full drift of it, but with further study, new insight will come. To many this will seem a curious and backhanded way of beginning the study of mind, for most text-books start in with an elucidation of neural processes and the gospel of dendrites,—things which only the post-mortem anatomist experiences first hand. These analyses we shall undertake are of things far more of the now and always, and the claim is here made that it is with this sort of thing that psychology is after all mostly concerned. Let

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us analyse the following statements in common use:

1. The action of the heart is purely mechanical.

Psychological interest is here focussed on the word "purely." First compare the above statement with what is left with this word omitted.

The action of the heart is mechanical.

The action of the heart is purely mechanical.

Logically it is the same, unless "purely" means "nothing but" or some such equivalence, *gratia verborum*, but psychologically this word adds one of several items to the situation. (a) It delays the utterance of the adjectival predicate "mechanical," and in so doing intensifies the effect of that predicate, and by the delay it causes also allows the first five words better to be assimilated and perceived as a unit. Or, (b) the word "purely" insinuates, by the tone of voice used in uttering it, something not altogether complimentary to the heart action and we are immediately affected by this bias in it.

2. Where did you go yesterday?

The answering of this question implies a memory. The full psychological putting of the matter would be something like this. The sensations of what objects and movements are

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restored to you upon the mention of a time twenty-four hours previous to this? Of course as a statement in psychology, it is very condensed, and does not ask by what means the memory is preserved, whether by vision, audition, movement, or speech; nor whether there is clarity or obscurity in the content of consciousness provoked by the question.

3. I have never heard of it.

We are concerned here with three things: (a) the past tense of the verb "hear," (b) the meaning of "never," and (c) the use of the preposition "of." As for the first of these, it refers again to memory; the second differs from the word "not" by temporal extent, drawn-outness,—"not" meaning a single point of time, while "never" means many "nots" in a continuous stream. The word "of," harmless as it sounds, is indicative of a very complex relationship. Whatever "it" means, whether an engagement between two lovers or a "cat's-paw" in calm weather, is surely a datum mentionable, happening somewhere, and more or less related to other things. But we do not say "I hear *of* a noise," as the Greek language says it; we say *hear* a noise, *see* a light, *smell* a rose; and only a few verbs in English are followed by the preposition in comparison with many other lan-

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guages dead or living. What, then, do we mean by "hear *of* it," in referring to a thing past? Why, this, that the observer himself told it, and we heard him tell it, and thus we use the word "of" for things that come to us in relays rather than directly and immediately. But this does not mean that the expression "think *of* it" is explained in the same way. "Think" is not always followed by a preposition, nor are the words which follow the prepositions necessarily things relayed to the thinker. We shall take up this matter vigorously when we come to the old bugaboo, "consciousness OF."

4. I like this ever so much more than that one.

Liking is something peculiarly psychological, and is the starting point for choice. It cannot be referred to logic, for people "like" that which all arguments show is false, dangerous, and sure to produce an aftermath of ill. "Ever so much more" is an attempt to make a scale of values, and is an example of the only "mental" arithmetic there is. "Ever so much more," also differs from plain "more" by the greater number of syllables intervening between "this one" and "that," allowing the voice to add emotion to the comparison.

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5. "Sicklied o'er with a pale cast of thought."

This line from Hamlet is an hyperbole in rhetoric, while it is a case of empathy in psychology. Empathy differs from personification in that it neither capitalizes the important word, nor does it imply as much animation as the latter. Thus, empathically, a mountain bears up the sky above it, while in personification the mountain is a man whose shoulders are overburdened with the weight of sky they support. Two of the words in this expression are strictly poetical,—“sicklied” and “o'er.” “O'er” is used for smoothness and fine sound, while “sicklied” is a “new” word, psychologically. It arose from the mood background which dominated the author. The word “cast” is used to express inertness, referring at the same time to the fixity and whiteness of plaster; the sound of the word also helps to convey one of these meanings. The above expression, taken as a whole and apart from the context in which it was uttered, need not have any clear, wholesome meaning at all, for it was not uttered as any thing to be formally defined or analysed. Certain sayings are indexes of moods, and moods are not always possible or profitable to press for their signification.

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18. The student will analyse for himself as well as he can the following expressions:

1. Fatima cigarettes are "Distinctively Individual."

2. The price of this waist is \$2.98.

3. He completely forgot himself.

4. Friends, Romans, countrymen, lend me your ears.

5. By merit raised to that bad eminence.

6. I have a good mind to do it.

7. The spirit is willing, but the flesh is weak.

8. Why, then the devil give him good of it.

9. He thanked his stars.

10. I only hope it is not so.

19. Out of the preceding examples much more could be derived than has been indicated, but the analysis of a thing as it stands is quite different from an historical account of its development. This item has particular point in psychology, for here one has to explain how things started as well as why they continued and what they are now. This, of course, brings one face to face with what are called *causes*, and every science is supposed to have ready-made answers to every question beginning with "why" that can be formulated. And while this is a logical matter entirely, this much needs to

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be said about it at this point. Some questions beginning with "why" are answerable, and some others are not. If the reader will look into a text-book of Logic for the "fallacy of many questions" and study the examples there given, he will understand that every question beginning with "why" is answerable only when it contains one question and only one. Moreover, only such things have a cause as can be analysed where at least one of the elements depends upon a temporal sequence for its specific effect in the whole to which it contributes. Furthermore, there are in every science what are called "elements," "primary facts," "irreducible first principles," and to ask the reasons for them *in that science* is to ask a question to which there is only an "old wives' fable" for an answer.

20. This can be directly shown by the following: As the writer understands it, the difference between mathematics and the other sciences is Time. There is, indeed, no mention of time in either Geometry or Algebra. Their principles, it is true, were found out by cultured gentlemen in this or that decade or century, but there is no t or t^2 in mathematics as there is, for example, in physics. Time being the one fundamental, independent variable of

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science, the sciences are logically arranged in point of the amount of dependence they show upon this temporal factor. In such an arrangement the sciences based on psychology are at the extreme end of the list, farthest from mathematics,—that is, from the mathematics which deals with general data and does not need to discount its answers upon meeting with the empirical situation. Less and less intricately involved in the temporal dilemma than is psychology are first the biological sciences, next the chemical, and next the physical. In the mathematical sciences, which come next, time is replaced by the sort of activity which generates the number system. As the time element increases in complexity in the scale of sciences, also, less and less do they become reducible to a mathematical or equational form. Now the questions propounded to the physicist which ask “why” are explained either by reference to mathematics, or by the elements of his own science; those put to the chemist are referred either to his own data, to those of physics, or those of mathematics; and so on throughout the list. But not every “why” in any one science is necessarily referred beyond that science. Some things are chemical, and that ends it. Thus, also, some things are

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psychological and *nothing else*, and the answer is vanity that attempts to find a first cause for them in the realm of things remote. The above-mentioned order, also, of the sciences is not reversible. One does not go to psychology, for instance, to find out the fundamental facts of geology, nor to the realm of esthetics for the fact that there are but three laws in Newton's formulation of the activity of moving bodies.

21. Many writers call these "elements" or "primary facts" assumptions, and mean by that word something not altogether complimentary to the science. It is not here to be argued why these should not be accepted as assumptions, with all the unlovely flavor that has accrued to the word; but, on the other hand, it must be remembered that no one *starts* a science, and that an assumption is not the first thing sought for by scientists. *All science is chasing flying game*, and no fair-minded scientist "assumes" except for the purpose of tentatively arranging facts in a probable order.

22. The principal thing, also, in answering the question "why," (which is far less important than the questions "what" or "how"), is not to explain things away by reference to something remote or forgotten, but to point out the functional dependence of various things on each

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other. *Cause* is no longer a live word in science. Only naive minds seek for a cause. Just as the words "must" and "ought" have finally lost their zest, even in Ethics, so the word "cause" is nothing to conjure with today. Cause always had the ultimate meaning of "who made it?" and "making" is nothing with which science has to do. That *vis viva* or *Anstoss* which formerly was said to *make* a stone in the air fall to the ground, or *make* a man follow theft with theft, is not any longer harbored in scientific thinking. Functional dependence has replaced it entirely, and by functional dependence the following things are meant: (1) that all natural laws are laws of description and not of necessity, and (2) that those laws are exhibited only when terms are free to be involved in the relations they entail. If a room is full of illuminating gas, *only when* there are persons in it will there be any deaths from asphyxiation; similarly, a nation will be successful in war *only when* patriotism is backed by a purse. "Only when," "when this, then that," "the conditions being fulfilled,"—these are the salient words in science today. Cause is nothing to be wept or argued over; the question "why" is sheer myth and biography.

23. It is by means of this principle of func-

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tional dependence that the empirical sciences, including psychology, become deductive as well. We shall see later on why, (apply the functional meaning from now on to this word), psychology is not a science of the "shreds and clippings of other things," nor a study of illusions or of brain perspirations, but a study of the functional dependence of mind upon the objects within reach of the sensitive and perceptive organs on the one hand, and of the action of auto-catalysed nerve colonies within the body on the other. A detailed explanation of the meaning of these expressions will be given in succeeding pages. Suffice it to say here, that the term "functional dependence" does not mean any chain-system of fore-ordained happenings, but rather the readiness of storehouses of energy to discharge upon the presentation of an excitant sufficient to arouse such discharge. The old idea of a cause (usually capital "C") too often meant a subtle, monistic push, which in the same way and to the same end brought about every change or effect. The idea of functional dependence, on the contrary, assumes no such gratuities; things which stand in a functionally dependent relationship need have nothing in common,—no subtle, interpenetrating power which on the one hand allows,

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and on the other hand brings to bear, the acting force. Every change, to be brief, comes about by virtue of an unstable equilibrium; but there are equilibria of continuity as well as of position. This is the same as saying that everything in the cosmos, unless it is manifesting this or that property exhaustively, is not fixed in that way of acting indefinitely, but is subject to any other combination of things strong enough to "capture" it. To use a crass figure,—if it does not do well in one occupation, it is free to enter another.

24. What bearing this has upon psychology will at once be seen, if we consider that all such discussions as the "dualism of mind and body," "the effect one mind has upon another," or "the way mind controls the body," have absolutely no meaning under the concept of functional dependence of mind both upon its objects and upon the neural processes which grow toward certain independent tendencies within the body. In this book no word will be said either for or against the dualism of mind and matter, for or against the way minds control bodies, and the like outworn doctrines. Mind shall be regarded as a cluster of objects and a colony of functions, and not as some hidden, uncanny ghost that roosts on a certain gland in the cere-

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brum, dabbling her feet in a puddle of lymph. The reader may be disappointed at not being able to while away a few more hours of his life with these old, old questions of such great moment. But a science does not begin with that sort of dawdling, nor is it furthered by persisting in it. We shall treat of mind empirically, as something that is just as patent as bricks and barley, and for such a treatment the reader is invited to be fully prepared.

25. It is now time to define the subject of this book—consciousness. *Consciousness is the objects within responsive range of the nervous system, and the manner in which they are responded to by the nervous system.* It is thus a *content*, or various kinds of things more or less organized together, as well as *degrees* of closely knit or looser organization. The most accurate as well as the most brilliant putting of this idea is to be found in Edwin Holt's "The Concept of Consciousness," Chapter IX, from which I shall quote at some length. (p. 168) "Let us suppose that a plane mathematically true but one millimetre thick passes perpendicularly through the roots, trunk and branches of a tree; and let us suppose all the molecules of chemical substances belonging to the tree and included within the section, to be simply enumerated. It is

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clear that this collection is an actual part of the tree, and yet one that in itself would contribute very little to the life and development of the tree. . . . Yet this would not be a random collection, for it would include none but vegetable molecules included within the intersecting millimetre plane. The plane, with what it includes, is exactly defined in terms of the entire tree and the position of the plane. Merely from the point of view of the vital organization of the tree would this collection be a random one. The law that defines the lie of the plane is not among the laws that define the anatomy and vegetable economy of the tree. Such a collection may be called a 'cross-section.' Similarly the prime numbers are a 'cross-section.'

"Again, if the plane is a geometrical one of no thickness and passing horizontally through the trunk, it defines by its intersection a collection of contours that is a true portion of the tree, but one that is even less significant for the total economy of the tree than the collection previously defined. A complete knowledge of it would be next to no knowledge of the tree as a whole. It would be, roughly speaking, merely a circular contour containing an infinity of minor contours."

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“Now the cross-sections so far adduced are not merely insignificant for the whole of which they are a part, but they are also rather insignificant for any system, howsoever inclusive. There are other cross-sections, however, which do have a prime significance in and for some manifold more complex and inclusive than the manifold through which the cross-section is initially made. Thus the sum total of all whales living in certain given waters is a cross-section of the sea that is significant for the whalers who are trying to locate and gather them in. The various shafts and levels of a mine are a cross-section of the mountain, and of import to the shareholders; it is the business of the engineer so to direct the workings that this cross-section shall coincide with that other cross-section that is made by the vein of ore.

“Once again, a navigator exploring his course at night with the help of a searchlight, illuminates a considerable expanse of wave and cloud, occasionally the bow and forward mast of his ship, and the hither side of other ships and of buoys, lighthouses, and other objects that lie above the horizon. Now the sum total of all *surfaces* thus illuminated in the course, say, of an entire night, is a cross-section of the region in question that has rather interesting

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characteristics. It is defined, of course, by the contours and surface composition of the region, including such changes as take place in these (specially on the surface of the waves), and by the searchlight and its movements, and by the progress of the ship. The manifold, so defined, however, is neither ship nor searchlight, nor any part of them, but is a portion (oddly selected) of the region through which the ship is passing. This cross-section, as a manifold, is clearly extended in space, and extended in time as well, since it extends through some watches of the night. This cross-section, furthermore, is in no sense inside the searchlight, nor are the objects that make up the cross-section in any wise dependent on the searchlight for their substance or their *being*.

"Now cross-sections that in many respects resemble the one just described are found in any manifold in which there is organic life." "It is to certain features, and not to others, of its environment that the living organism responds, and the group of things to which it thus reacts constitutes a cross-section manifold that is of prime importance to one who is studying the organism and one that is of the most vital importance, of course, to the organism itself."

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(p. 173) "We have always known, of course, that plants 'respond' in a general way to sunlight, air and water. More recently we have become acquainted with processes that are more appropriately named responses. Roots do not grow downward by chance nor by any pre-established harmony, nor yet by instinct, but they respond mechanically to the attraction of gravitation, nor is this merely due to the general weight of the root, since by a comparable mechanism the stems grow contrarily to gravitation. The roots are positively geotactic or barotropic, while the stems are negatively, and many kinds of branches transversely barotropic. Similarly, and by virtue of a distinct mechanism, the various parts of a plant respond variously to light of different colors and intensities, growing toward or away from such light: they are variously heliotropic. There are similar responses in vegetable organisms to thermal, chemical and even electrical stimuli, and we are gradually coming to know that these involve a well-differentiated and oftentimes a highly elaborate mechanism of response. Now clearly in the case of a given plant these baro-, helio-, thermo-, chemo-, and galvano-tropisms, these several mechanisms of response, define a certain cross-section of the plant's environment

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that is comparable with the cross-section defined by the searchlight. . . . And these forces, be it noted, to which the plant responds are distinct from the mechanism by which the response is effected; *they are a portion of the environment.*"

(p. 178) "In the case of vegetable organisms we found that the sum total of entities in the surrounding physical system to which a plant responds, forms an intricate and in some respects an interesting cross-section of such physical system. And from the point of view of the plant, clearly, this effective environment is all the environment that it has; and this environment is distinct from its own organic structure. We saw, furthermore, even in our earliest cross-sections, in inorganic manifolds, that the cross-section often so cut the manifold as to reveal the conceptual or neutral nature of physical objects; the *velocities* of all flying projectiles, and the section of a tree cut by a mathematical plane, were such cross-sections. They are true parts of the projectiles and the tree, respectively, yet they are not ponderable physical bodies: they are certain neutral components of these bodies. The same is *a fortiori* true of the cross-sections defined by plant responses. The leaflet bends toward a ray of

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light (a physical energy, if you will), but it responds more rapidly to a more intense ray, and to a very weak ray it will not respond at all. It therefore responds not merely to light, but also to intensity. In responding differently to different grades of intensity, it defines *grades of intensity* as well as light energy, as components of its effective environmental cross-section. Now whatever light may be, *grades of intensity* are not physical objects. And these grades of intensity are not *in* the plant, certainly no farther in than the surface of the leaves. In a similar way plants respond in all their tropisms very specifically to *direction* 'as such'; and direction is a neutral entity. It too is not *in* the plant. And if we were thus to study plant response in detail, we should find that very few indeed of the factors to which the plant responds are such entities as would ordinarily be said to have 'physical' existence; although both the plant and its environment are plain, physical objects."

(p. 182) "We have seen that the phenomenon of *response* defines a cross-section of the environment without, which is a neutral manifold. Now this neutral cross-section outside of the nervous system, and composed of the neutral elements of physical and non-physical ob-

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jects to which the nervous system is responding by some specific response,—this neutral cross-section, I submit, coincides exactly with the list of objects of which we say we are conscious. This neutral cross-section as defined by the specific reaction of reflex arcs is the psychic realm:—it is the manifold of our sensations, perceptions, and ideas:—it is consciousness.” In this conscious cross-section, furthermore, let it be understood once and for all, that everything ever called mental, psychical or any other term referring to knowledge, awareness, feeling or judgment is unequivocally and thoroughly contained. If there be mystery, also, it is right there; as well as dreams, hallucinations, and the other twilight phenomena of psychology. Those “having minds, and therefore claiming an *a priori* peek into their nature,” are none the less referable to this concept of consciousness for an explanation of their sayings and thinkings. For while we select for our laboratories only those having gumption and grandfathers, a complete psychology accounts satisfactorily for the whole gamut of human interests, affections and disaffections. Furthermore, we shall not say anything about the ‘purely’ mechanical or the ‘purely’ mental; things will be just plain mechanical and plain mental, instead. Hard

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atoms and soft souls may suit the temperamentally minded, but whatever vanities science may exhibit, temperament is not one of them. However, psychology being the realm in which temperaments operate, no grudge need accompany the task of explaining them.

26. We are then not going to study capital M mind, nor are we to treat of consciousness as an inner imp. We shall treat of it as a varying content, as a shifting process, and as a manifold with a highly unstable center of reference,—the pronoun I. The language by which we express our thoughts has been shown to be now too abbreviated, now too redundant and oftener than either, too erratic to be depended upon for scientific purposes without pruning and redirection. Our naive view of mind, also, must for a time be passed through the fine sieve of analysis in order that confusion of words be avoided. This is not a materialistic psychology, but a realistic one which is here presented. In the next chapter it will be shown why materialism is too theological for scientific purposes. A scientific psychology has neither intention nor power to deny the existence of anything which humanity has found meaningful, but there is no law in the universe which guarantees that accuracy shall be evolved from

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chronogenetic thinking, nor that what we are wont to say about ourselves need have any truth in it at all.

Bibliography.

Holt, E. B., "The Concept of Consciousness," especially chapters VI, VII, VIII and IX.

James, W., "Essays in Radical Empiricism," especially Chap. I, "Does 'Consciousness' Exist?" and Chap. III, "The Thing and its Relations."

Mach, E., "Contributions to the Analysis of the Sensations," especially the "Introductory Remarks. Antimetaphysical."

CHAPTER II.

PSYCHOLOGICAL ANALYSIS

1. Whether one asks "what" the mind is, "how" it acts, or "why" it does thus or so, the answer is to be sought for only in analysis. For all such questions insinuate either a content or a process not yet discerned in its parts or relations, and only an answer that is explicative will suffice to enlarge our knowledge of the subject. The test of analysis also rests upon its giving such answers as will clarify rather than becloud the matter under investigation, but it scarcely needs to be said that the goal arrived at does not gain its validity from squaring with naive expectation.

2. Psychological analysis concerns only the data of psychology. We do not analyse glaciers by it, nor do we seek to discover by its use the laws of thermo-dynamics. But the colors of glaciers may be analysed by psychological means without any reference to the speed of those masses of moving ice which are colorful as well as cold. In the same way, the manner in which the laws of thermo-dynamics were found are material for psychology, since the human beings who struggled to know them rea-

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soned from the data as minds are always wont to reason. Notice these cases of such analysis.

(a) Orange is a mixture of red and yellow, while violet is a mixture of red and blue. The position of these colors in the spectrum tells nothing about their properties when abstracted from such a series, but by means of the eye alone we detect something both reddish and yellowish about orange, and something both reddish and bluish about violet. On the contrary, we cannot analyse either green, yellow, blue or red into anything else, and so for psychology these are ultimate hues.

(b) One closes his eyes, and tells as well as he can the direction from which a sound is coming. By turning his head this way and that, by pausing and carefully listening, he finally decides upon the general direction by means of his ears and movements alone. Then, under the same conditions, two sounds are employed which he is to distinguish as being equally or unequally far away, symmetrically or unsymmetrically placed with reference to the head, and so on. Each time he attends, estimates and judges by the same means and thus is said to analyse the situation psychologically.

(c) While we are sitting in a hotel lobby, a scuffle occurs on the street outside and some

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one is badly hurt. The matter becomes of legal proportions and our testimony is required to determine the exact status of the offense. We saw something, heard something, and were somewhat disturbed over it, but just what occurred that we can swear to is not quite clear and plain. Court-room testimony follows, and, by reason of agreement among veracious witnesses, there is a verdict. The process of recalling what happened, how it developed, and why the case ended as it did is entirely a psychological matter, and the results are vainly appealed to other than psychological beings,—justice or injustice being the residue of seeing, hearing, remembering, feeling, intending, and so on, with which no physicist, chemist, astronomer or other scientist is able to deal with first hand at all. Psychology exhausts it utterly.

(d) An old and wealthy uncle does not shake off the mortal coils soon enough to suit his prospective legatees. They each know what his will provides for them, but, fearing that he may change his mind any moment, try to get him committed to some asylum in order to gain their present ends. But the uncle is individualistic, and far from allowing himself to be beckoned unresistingly away, fights the attempt by legal means. Alienists are called in and his

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mind is thoroughly tested by analysis to prove or disprove the charge made against him by his relatives. Whom else should they call in except psychological analysers? Psychological data are the ultimate things in the case,—the uncle's habits, temper, typical manifestations of all kinds,—and when these are sifted over and over again to a conclusion, there is no appeal beyond it. The uncle is what he does, says, feels, and the like, and the result is totally in and of psychology.

These will suffice as a preliminary to other analyses which must be delayed until later topics in the book introduce them.

2. Just what analysis properly is may be shown by the following quotation from E. G. Spaulding's "A Defense of Analysis," from the "New Realism" (p. 161):

" Given a whole which, for one reason or another, is known to be analysable, then analysis reveals parts, but *it also reveals the relations* which relate and so organize these parts into some kind of a whole. Consider also those properties which, in some cases, the whole, as a whole, may have different from those of the parts. Of course, analysis reveals these also. The analysis may be incomplete in the sense that there may be further parts, that is, parts of

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parts, which are not yet revealed; but, if analysis is incomplete only in this sense, that is, if there have been revealed parts, their organizing relations, *and*, in some cases, the possibly specific properties of the whole, then the analysis may be said to be adequate. It exhausts the whole up to the point that it reaches, in that, while the specification of all that the analysis reveals does not specify the whole, the whole, nevertheless, *is* the parts *and* their properties *and* the relations relating the parts *and* the possibly specific properties of the whole. There may be further parts of parts, more properties, more relations to be revealed, but this of itself does not invalidate the position that the properties of the parts and the generating relations which are revealed are quite as real as is the whole which is analysed, are not contradictory of the whole, and exist, or subsist, independently of the discovery and of the specification." To apply this to a case in point in psychology, the analysis of a so-called "mental" situation into object and response, or into content and process, does not make it "physical" or "neurological" to the exclusion of its being "psychological"; no more than does the analysis of the pictorial representation of a triangle into three straight or three curved lines make absurd

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or impossible the mention of triangularity along with the mention of the lines. This also is a vital point: that the *psychological* simplicity of things is too often mistaken for *logical* simplicity; for it shall happen that ever so much more than we suspect is blended into a single sensation, emotion, or perception, which only analysis can reveal. But we shall find that there is nothing "mental" *behind* the psychological wholes we analyse into parts, or those psychological things we split into their attributes. The "mental" is an organizing relation, separable from the organized elements, and in no sense bewitching them when out of such relation.

3. There is today in some quarters much opposition to the analytic method in psychology. It is said to *invent* rather than *discover* the parts and relations it finds. This hails from that era of lazymindedness when a "mental" *substance* and a "physical" *substance* were said to irrevocably dichotomize the universe; from which *substances* bodies and souls, matter and mind were held to emanate. Two great unknowns were hypothecated, — unknowns, mind you, and yet mentioned with all the toplofty grandiloquence of philosophy's worst. Objects and thoughts were then simply the scruff of

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these mentioned unmentionables in which reason, value and stability were forever snugly sequestered. To be sure, death has been kind enough to remove some of the upholders of this doctrine from our sight, while the advance of general intelligence has revealed the unpleasant, ulterior motives lying behind it.

4. Even today a timidity characterizes some of those who defend analysis. One defender to whom I could specifically refer asks why he shouldn't use it, since even its defamers employ it in their attacks. Another avers that for "scientific" purposes one must *assume* the analysability of all subject matter,—for since minds are free, they are therefore even at liberty to consider themselves purely or grossly mechanical, just as they choose. Both of these defenses are all too timid, and the flank attacks they allow and invite would be in both cases deadly, if undertaken. Let us surmount these arguments as we have done former ones. As far as the first is concerned, it is a lame excuse to claim the victory on a draw. If defamers of analysis use it, of course they involve themselves in a net, but that is hardly the point. The point is whether they have used it expressly to get involved in the net, for if this can be shown, we

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need only account it another defeat for verbalism. And verbalism is just what it always turns out to be. This is, indeed, being almost too generous; for having to extricate from their own "mire of logic" those who wilfully fall therein, would not be half so pathetic if it might only show in this case that analysis had been a word misunderstood,—a name much taken in vain. To show where analysis is effective, one has only to point to those cases where it neither controverts itself nor fails to reveal the parts or relations it chases hot-foot after.

5. As for the second of the above statements, it misses the whole point in the matter under discussion. Analysis defines neither freedom nor continuity. It arises merely from the wholesome suspicion that the safest and wisest thing to do is to continually regard as ultimately complex that which appears psychologically simple. It grants, for instance, that looking at a color and saying nothing about it may be a single, illy defined state of mind. But that is not the only sort of color experiencing we find in the cosmos. Artists and physicists mention their colors and thereby get involved in the game of talk; and, curses or no on the man who discovered logic, the mention-

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ing of colors even throws light upon the experiencing of colors without mentioning them at the time! Besides, according to this wisp of a sentence about "mental freedom," almost any sort of declaration one felt eager to make might have a place in the sun. I vaguely recall reading somewhere that the word "Adam" (the garden variety) means "a dam" or "obstruction," whence is proven that "mortal mind" is very, very impervious to spiritual influences. There was a day, I am told, when word-juggling such as this passed for logical astuteness.

6. My own defense of analysis is as follows. Even if there should be in everything one attempts to analyse two series,—one, an indefinite continuity, the other a discrete discontinuity; the first giving it thinghood out of ineffable substance, the second giving it thinghood out of elements in relation,—only the latter being reduced to parts by analysis,—then it is high time to enquire what is the difference between them in the aggregate which they form. If, for example, there are two coats in the coat I wear,—the one made up of the pieces of cloth sewed together, and the other a something which as a concept or idea is not destroyed though the coat be cut up into patches,—then of course what I analyse in this and in other

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situations is made of parts, and not that coat "which was from the beginning and is now." But even if a concept, or idea, say that of a coat, can be shown to differ from another concept, say that of a card-case within the coat pocket; and if their differences can be made specific, then what is different must differ in nameable ways. And if the difference between concepts is such a one as this, and it is, then all concepts are as analysable as are "things," for one concept will differ from another in the same way as one "thing" from another. Thus the "mental" and the "physical" are both equally mentionable and analysable. We shall see presently of what their parts are made. And if any one says that the science of psychology does not come within three miles of explaining his mind, I shall only remand him either to poetry for solace, or to these words of William James for reproof: "Things of an unexperienceable nature may exist *ad libitum*, but they form no part of the material for philosophic debate." Again, if it is said that one loses most of the specific properties of the whole in the midst of analysis, and has but "shreds and clippings" for his pains, one then but sees what a powerful logical weapon it is, for by means of it he can find out, as his analysis proceeds,

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just where this or that property of an organized whole vanishes from the complex. So that along with the "immoral value" of destruction comes the cognitive value of locating and trouncing the "mysterious."

7. Rebounding flabbily from these arguments, the adversary once more challenges: "What you should do is to 'synthesize' rather than analyse; build up rather than destroy in your scientific endeavor." We reply with a double answer. Things are first found synthesized, but the fusion and confusion thereby entailed is quite opposed in many cases to the purposes of science. You cannot make a Botany out of the chronogenetic order of trees and flowers; indeed, you can just passably make a garden. And this: the synthetic, temporal order of nature is not the only synthetic order possible; nor is it the order, whether or no, which makes any science deductive. So that, far from avoiding the issue, the scientific analyst accepts the task of two lifetimes,—both that of following the chronogenetic syntheses of nature and that of planning the way for that synthesis which shall best suit the practical concerns of subduing nature for his own spiritual ends.

8. Psychology, as the science of the con-

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scious cross-section, is stated in the same way as any other science, namely, by the use of terms in relation. For example, Boyle's Law states that, "For the same temperature the density of a gas is directly proportional to the pressure acting upon it." Now as it stands, the chief relational aspect is contained in the words "directly proportional." Also as it stands, the terms are these three: (1) For the same temperature, (2) the density of a gas, and (3) the pressure acting upon it. But (2) and (3) are alone immediately related to the expression, "directly proportional"; for when the temperature varies, another relation replaces it. But in psychology, one frequently finds that the expression "other things being equal" (such as equal temperatures in physics) does not often suffer itself to be used in a formula. That is to say, that one difference between physics, as a fairly deductive science throughout, and psychology as a science deductive only in point of large masses of terms in relation being construed as units of functionation, is that we cannot confine the "proportionality" of terms to that immediate relationship in which we seek to embed them. For instance, one can predict the actions of a crowd better than those of a single individual, on account of the motives

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there operative having a maximum of imperative urgency. The problem of three celestial bodies perplexes the astronomer, while three "busy bodies" gives the psychologist no concern. It is the business of psychological analysis to find the extent to which deduction of one kind or another pertains to the whole diameter of the conscious cross-section.

9. The use of relations demands that they be distinguished from one another. We saw in the first chapter what one meaning of the "of" relation resolved itself into. "Having" is also a complex set of relations and functions all telescoped together in language. One difference between legal and logical form may be here inserted for the benefit of the light it throws upon psychology,—and that is that the law repeats the psychology entailed in a situation by the use of synonyms, rather than it defines unequivocally any term or relation employed. To insure the "having" relation, one legally gives, bequeaths, bestows, etc., rather than signifies what all this business specifically means. The number of relations is well-nigh legion, and for many of them our names are inadequate. "Before" has no linguistic differentiation when used as a temporal expression from what it has when used as indicating log-

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ical priority. Likewise, "next" is used for a spacial as well as a temporal, or other relation without any change in spelling. Such examples could be multiplied *ad libitum*, but suffice it to say that this condition of inexact definition in language is what makes oratory possible. There are spacial relations, temporal relations, logical relations, and still other relations, not a few of which are psychological; for which, following the example of symbolic logic, fit expressions will be eventually found. But before this is done, we can still point out a few characteristics of relations in general which must be kept in mind in order to understand the logic of any science. As follows:—

(1) Transitivity. If "R" between x and y indicates that they are in relation, then the relation is a transitive one if xRy and yRz together imply xRz . Otherwise it is intransitive. For example, in learning some complicated operation, such as piano playing, every distinct movement or set of movements is serially focal in consciousness. Whereas later on, upon the mere mention of this or that piece of music, consciousness is solely involved in the motor aspect of a tidy performance, the stages of learning having been looped into the co- or sub-

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conscious, never to reappear unless aroused through interruption.

(2) Symmetry. If xRy implies yRx , the relation is said to be symmetrical. This will have bearing for us in the phenomenon of simultaneous as opposed to successive presentations of a stimulus. Indeed, "before" or "after" in psychology always involves something more complex than at first sight seems. The touch of velvet after the touch of emery paper may arouse one kind of feeling-consciousness, while the result of reversing the process may produce another or even the same kind. Temporal successions in psychology are very delicate and intricate things to handle. But the very same phenomena are found in other sciences. Even the business of making microscopic slides involves an asymmetrical temporal series of infiltrations. The chef also uses this principle in making butter sauces.

(3) Correlation. This is of two kinds, ordinal and mixed. For instance, if there are two series of measurements, S and s , the terms of which are $A, B, C, D, E, F, \dots, N$ and $a, b, c, d, e, f, \dots, n$ respectively, and if Aa, Bb, Cc, Dd , etc., are specifically coupled together in this as well as in the reverse order, we have a case of ordinal correlation. In some cases of paired

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comparisons with steady and constant subjects, such a correlation has been approached for psychology in a limited series. Oftener, indeed, the mixed correlation is derived, which consists in the coupling of any term of one series with any term of the other in any order.

In all cases of relations, the *domain* of the relation has to be considered. Consciousness *of* we shall see has but a limited use. Likewise only a few series will be transitive, symmetrical or ordinally correlated. What series they are as well as the precise meaning of these relations in psychology should be at all times clearly kept in view.

10. Before sorting the conscious cross-section into its different compartments, I shall quote from an article by R. B. Perry entitled "A Realistic Theory of Independence," found in "The New Realism," to lay the ghost of some common notions in regard to the nature of complexes. This will be the last mention of *substances* in this book. The quotation starts on page 107 of the above mentioned book with an analysis of certain further relations common to the material of psychology.

"*Whole-part*.—A whole is said to be dependent on its parts,—on what it contains, and can be divided *into*. It is worth while to in-

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troduce at this point a distinction between 'material' and 'formal' instances of the whole-part dependence. The first is exhibited in the relation between the present city of London and Trafalgar Square. . . . The second is exhibited between a city and its streets. . . . In other words, a material relation is a relation between particular values of variables, while a formal relation subsists between the variables themselves. The dependence of whole on part may be of either type.

"Part-whole.—Parts are said to be dependent on the whole to which they belong when these wholes are 'organic.' Thus the hypotenuse of a right-angle triangle is . . . dependent on the definition of the right-angle triangle." ". . . its magnitude is determined by its interrelation with other parts, such as the opposite angle and its adjacent sides." "Similarly, an organ or member in the biological sense is said to be dependent . . . on the integrity of the organism to which it belongs.

"But such dependence would appear to be reducible to dependence of other types" . . . "we are virtually *naming a part for its participation in a whole.*" "Or it may be construed as meaning that a part cannot be *a part*, that is,

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belonging to a whole, without the whole. But this is equivalent to saying that the complex relationship of part and whole depends on the whole as one of its terms. And this is a case of dependence of whole on part, and not of part on whole."

"The dependence of members of a living organism may be disposed of in the same manner. The respiratory system cannot be a vital function without the whole organism. But this is merely to say that it cannot belong to an organism without an organism to belong to. To make the dependence of the part evident one must describe the part as part-of-whole. But the dependence of member-of-organism on organism is not a dependence of part on whole, but rather a dependence of whole on part. It asserts the dependence of a complex relationship on one of its terms.

"Thing-attribute.—[This] relation presents no novelties in connection with the matter of dependence." " . . . where a thing is regarded as dependent on its attributes, it is either 'made up' of them, or defined 'in terms' of them. . . . Both would be instances of the whole-part type of dependence as described above." (This has an insistent bearing upon

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the analysis of sensations which we shall take up in the next chapter.)

“Attribute-thing.”—The question of the dependence of attributes on the thing to which they belong, resembles the question of the dependence of part on whole. Red cannot be attribute of the rose without the rose; nor would it bear the peculiar relation that it does to odor, form, and growth of the rose, were it not for the nature of the rose as a whole. But this will, I think, turn out to mean either that a rose is a rose (redundancy); or that the red-rose relationship depends on ‘rose’ as one of its terms (whole-part); or that the redness of the rose is determined by its age, chemical structure, nutrition, etc. (causation). We may therefore dispense with the attribute-thing relation as a primary type of dependence.

“Causation.”—“ . . . Causality is a material relation between two complexes, derived from a primary formal relation between their constituent variables.” (N. B. This is what I meant in the first chapter by saying that every science was a case of applied logic.) “Thus if $v=gt$, for all values of these variables, then any given velocity (v), is dependent on the constant of gravity (g), and some magnitude of time (t). The formal relation among the vari-

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ables is called the 'law,' and the material determination of the values of the variables, as prescribed by the law, is causation.

“. . . it is customary to limit the adjective 'causal' to laws which contain time as a variable; and to treat time in the positive or forward direction as the independent variable."

"It is to be remarked that causation is conditioned by the law. In other words, it takes place only *within the system which the law describes*; [N. B. the use of "*only when*" in the first chapter] and can be attributed to a complex only when the complex is identified as 'a case of' the system. . . Causes and effects are thus interdependent *within the given system, or under the law*. These determine their behavior under certain conditions, but do not prove that the conditions themselves are necessary. For it is possible that a given complex should be accounted for in terms of one system, and yet conform to the requirements of another system as well." Or *not* conform, equally well either. It does not need to be an *illusion*, or a thing to be apologized for that some things are psychological *and nothing else*. My uncle's house can well be mortgaged and part of my summer night's dream world at the same time.

"*Reciprocity*.—It is customary to use the

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term 'reciprocity' to express a relation of the same type as causation, but without the same emphasis on temporal antecedence and consequence. It is evident that the relation among the various values of the variables of a law is mutual. It is possible not only to predict the future, but also in like manner to infer the past. Similarly, it is possible to infer simultaneities, as *e. g.*, in the case of the configuration of the planetary system, or the co-presence of extension and color in the visual field. It is not even necessary that time should enter into such calculations at all; as is illustrated by the interdependence of spacial magnitudes as formulated by geometry. 'Reciprocity,' then, may be taken to mean the mutual determination of values of variables under the law, where the factor of time-direction is not essential."

11. Now the very reason *substances* have had their little day and cease to be in enlightened science is just because the pursuit of relations to their lair has shown not only that they are neither mental nor physical, but also that they are the very tissue of the organization of the cosmos. It is these which cement the elements of things together, and are not *substantial* in any sense in which that old pair of disreputable cronies, *Matter* and *Mind*, were

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latterly regarded. The significant differences in the universe are relational, not substantial, and not "mental," either, in the sense of being generated, altered and dominated by *thinking*. Relations are indeed the hardest data of the cosmos, and inasmuch as they are the core of every fact, must be treated with something else than other-worldly-mindedness if one is to treat with them at all fairly. I promised in the last chapter to show why materialism is too theological a doctrine for scientific purposes. This is the pat place for doing so. The "logic of relations," into which we have entered here at some length, would serve in physics to show that there are some things which are not physical or material even in that science, and that those things (relations) are quite more important to the universe than the microscopic and Oh so hard! brick-bats which the old-line materialists claim to be the ultimate stuffing of the cosmos. Every *substance*-theory of the universe is theological. The absolute idealist and the absolute materialist differ only in the amount of personality they ascribe to the prime substance behind everything. Ego, egg, atom, ether-squirt, ether-vortex, hole-in-the-ether,—whichever of these one chooses, it is only a different name for something hidden and mys-

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terious,—something supposed to add profundity to the faith by virtue of its remoteness and awe-inspiring character. As we approach nearer to the data of psychology, also, it will be seen that all of these notions must be discarded. “Spirit-stuff” is as relational as “matter,” and when one analyses even “souls,” one finds no hidden, mysterious thing there at all. At this the student may well throw up his hands, wondering what there *is*, if matter and mind are equally to be pushed aside.

12. It is now time to sort the data of the conscious cross-section. By *consciousness* we shall mean every object within range of the nervous system,—whether it be our neighbor planet, a finger nail, a mathematical problem, or a call from starving India; as well as every neural process going on entirely *within* the epidermis,—such as the gastric and other splanchnic functions, spinal perceptions, or cerebral functionations; in addition to which are the responses from body to object, no matter how far distant or how abstract it is. But among this host of objects and responses only a few are within instant report,—only a few items of the possible content are taken up and dealt with furtheringly or effectively. Now, bare notice, without naming or further handling, as well

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as such items barely noticed, we shall call *awareness* or *sub-focal* consciousness. Those we fix upon and deal with furtheringly, we shall call *focal* or *attentive* consciousness, as well as so denominate the processes involved. Those contents and processes which are the next less clear than *awareness* or *sub-focal* consciousness, we shall call the *co-conscious*; while those processes only (not contents, for the contents cease with *co-consciousness*), which serve especially to others than ourselves to elucidate the status of these first three elements, we shall call the *sub-conscious*; meaning also by the term that they are evermore present as physiological processes defying any kind of elevation to focality. While the term *un-conscious* shall be used to indicate those physiological processes which have less and less specific and directly traceable influences upon the more focal divisions of consciousness. Language normally functions for but the first three divisions enumerated above. Abnormally, however, it functions for the fourth, but never for the fifth. This, I take it, is the logical division of the conscious cross-section into its grand divisions; and it must be noted that it makes no more provision for genetic psychology than a general treatise owes to such a subject.

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13. The above analysis may be briefly termed focal distribution. What become focal are, in the main, three items,—sensation, perception and emotional complexes. Now sensations illustrate the attribute-thing relationship, perceptions illustrate the part-whole type of organization, while the emotional complexes illustrate a special type of attribute-thing-function. Furthermore, sensation is found in the sub-focal, focal and co-conscious divisions, perception is found in these also with the sub-conscious added, while the emotional complexes are chiefly concerned with the sub-, co-, and focal consciousnesses. The causal sequence of these will be shown in the special chapters treating of them, as well as the succession of the various focalities of consciousness owing to qualitative and quantitative elements in the sensations, perceptions and emotional complexes to be presented.

14. From this it can well be seen that one starts with nothing “simple” in psychology. In the next chapter sensations will be analysed into more than a dozen elements. Perceptions will turn out to be sensations organized into structures which have *meaning* when there is motor readiness to act somehow in regard to them. Again, in the emotional complex it will

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always be a situation to which we shall refer, and not to a conscious atom to explain the “mental” aspect of the items discussed. Every bit of our living and moving is immensely complicated. But this does not make it impossible for psychological “simples” to be found. They will not, however, be stated by the use of *nouns*, but of *verbs*, *adjectives* and *adverbs*. It is the manner of the response to the environment which defines psychology,—not the things responded to. Also remember this: that the *environment* referred to in various situations means neither “that mysterious ‘external’ world beyond the limits of our skin,” nor does it mean the same in each mentioned case. Often the environment is *within* the body. When we say we have a toothache, it certainly means that the vocal organs are functioning the response of the general somatic condition to a special environment centered in the tooth. Individual environments also frequently occur. From a large group of things we select only specially interesting features as material for speech and memory. For example, the brute mass of a football field and the players is first grossly cross-cut by the two sympathetic teams of “rooters” opposed to each other in the grandstand; and again curiously cross-cut by any in-

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dividual witness whose special interests center in one or more of the padded giants in the turf. An account of the football game, if complete, would then be the sum-total of all spoken or unspoken judgments, emotional or otherwise, that those preparing for it, witnessing it, and remembering it would make. However complex the physical situation there might be, the psychological aspect would outdo it ten to one. To ask which of the football games as reported is the *real* one, has no meaning for psychology. It is the task of our analysis to determine the order in which things get known, as well as the succession of impulses which determine the selection for speech and recall of several items out of a possible multitude.

15. It is clear that in the realm of psychology more newness continually develops than in any other field. As we develop from childhood to age we get a personality, a bias, a way of employing the material of the cosmos in such a manner that there arise from our own nervous organization certain dependent sets of functions which point our doings in ways that are "new" with regard to the material they respond to. Within our own bodies, also, there are colonies of nerve fibres which act upon and are reacted to by other colonies, in such a way that refer-

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ence cannot be made solely to the common, uncritical names for one's environment to explain why our actions are thus and so. This also must be kept clear: that if the responses to their objects by one nerve colony is of one kind, and the responses by another nerve colony is of another, that the responses of the first colony, say,—to its objects,—may be so modified by the intercolonial responses that the result will be "new" and unpredictable from the mere knowledge of the way in which either colony alone would have reacted to the situation. It is the task of analysis, again, to label correctly all the "new" responses,—those primes in the series of psychological events.

16. Much perplexity often arises over the question of the *position* of things in mind. "Where is a tooth ache, especially its disagreeability?" "Where is the pleasure of a good meal?" are typical of the questions sometimes asked. This question ultimately concerns the nature of series, and I submit this as an answer. Some series are in time and space, while some others are not. Those in time have position in time and those in space have position in space, while those in both have two positions. But when one asks where the discomfort of a toothache is located, or where hope, fear and

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joy may be found during their office hours, the answer is that there is at least one more order than the temporal or spacial order in psychology, and that is the order of knowledge. ("For space and time are continuous, while knowledge is not.") Only this order is not independent, as are the orders of time and space, but dependent partly on them and partly also upon the logical, deductive orders of things, which are neither temporal nor spacial. For example, the virtuous kings of England, if named in the order of their virtue, would not perhaps come in the same succession as they did chronologically to the seat of the Confessor. The order of their virtue could not be deduced from this other order any more than the order of their seniority upon ascending the throne. The orders, or cross-sections, of these British monarchs would show no ordinal correlation. And when any other order than the spacial or temporal order is involved, "position" cannot mean something geographical, any more than the phrase "in my mind" needs to refer to the head or the bone-bound mass of wrinkled gray matter within it. Now, the toothache is not in the front sidewalk, to be sure, nor is the pleasure of gourmandizing in the handle of the knife that carves the truffled grouse. In both of these

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cases we have series to consider, and if the toothache or the dinner-delight *is* anywhere, it is in that manifold which is defined either by the terms of tooth, nerves and rest of body; or grouse, unobtrusive waiter and the other fine business of eating. Its position in these complexes somewhat compares to the meaning of "never" in contrast to "now."

17. There is but one more thing to which I wish to call attention before we pass on to the next chapter. It is the use and meaning of "and" in psychology. We shall find that a sensation as well as a perception, a sentiment, a will-act, a soul, is a complex,—a number of things more or less organized together. They bear to one another in psychology among other things, the "and" relation. Now this "and" is one of the psychological simples mentioned before,—one of the things which is psychological and nothing else. It is the first one mentioned, and it is to be expressly noted and filed away for reference that it is not a "noun," but a "conjunction." We shall get the verbs and adverbs by and by. Here we may see one of the points at which logic, psychology and grammar coincide,—namely the letters making the word "and." But spelling here serves a function that analysis must undo. The grammat-

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ical "and" is of course a special form of the logico-psychological "and," being exclusively neither nor all of both; it is something elementally linguistic." The grammatical "and" is sometimes expressed by a comma. This again means a pause in the voice, or, logically, an enumeration without inference. Grammarians call this repetition,—as for example, "Hundreds *and* thousands of dead and wounded." Variation or difference with insinuations is another meaning; as "there are lawyers *and* lawyers." Or, the attributive relation may be poetically expressed, "thy fair *and* outward character," i. e., outwardly fair character." Sequence is inferred, or causation,—"I say 'go,' *and* he goeth." It sometimes means "*or*," as in the expression, "taxable for state *and* county purposes." In the expression, "I shall try *and* learn," it means "in order to." In symbolic logic the same sign is used for both "*or*" and "*and*"; the interpretation and reading of the sign being dependent upon its place in the subject or predicate. Now the use of "*and*" in psychology may, possibly, be any one of the above uses at times, but the peculiarly original psychological use of the conjunction "*and*" is as follows: Consciousness is both a content and a process, and the contents, which are all

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analysable into non-mental material as well as are the processes, exist together and arouse impulses in a way that is not found elsewhere. The combination, the organization of these contents and processes we shall call, for brevity, an exhibition of the "*with-for*" relation. And let us add that it is not mysterious. If a realistic psychology needs any justification, it will be found in the development of this principle throughout this book.

Bibliography.

Perry, R. B., "A Realistic Theory of Independence," in "The New Realism," by E. B. Holt and others.

Spaulding, E. G., "A Defense of Analysis," in "The New Realism."

Holt, E. B., "The Concept of Consciousness," especially Chapter X, "The Empirical Properties of Consciousness."

CHAPTER III.

THE SENSITIVE AND PERCEPTIVE ORGANS

1. “. . . there are not sensations and perceptions *and* their objects. There are objects, and when these are included in the manifold called consciousness they are called sensations and perceptions.” . . . “In sensation the neutral qualities, the so-called ‘secondary qualities,’ come and go as more or less unrelated elements: while in perception they enter and depart in groups—smaller or larger. Doubtless few, if any, qualities (sensations) enter consciousness absolutely single: they too seem to come and go in larger or smaller masses. But . . . the term sensation is usually applied to them so long as the mass of qualities that enter together has within itself little or no logical structure or unity, no internal relationship: while in perception the groups have some logical coherence.” This again from Holt with many thanks.

2. Why do we habitually say, “I have a sensation OF color”? Or why, again, do we assert our recollections OF people, our feelings OF sadness, our consciousness OF this or that? Is it because we feel a gulf deeply fixed be-

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tween ourselves and this world of ours which so constantly stays with us? Or is it a defect of language, and has a little wall-eyed preposition the power of dropping a veil over our eyes, thus making us like unto the Turkish ladies who are calamitously and at all times cut off from the bright realities?

3. Two possible explanations are open and we shall consider them both. (a) The Linguistic approach. Usually such expressions can be avoided by the use of other words. "I have a sensation *of* blue," means something different, does it or not, from the expression, "I sense the blue object"? "I recall him," means what different from, "I have a recollection *of* him"? "I feel sad," is or is not the same as to say, "I have a feeling *of* sadness"? Or when the psychologist says, "It is *in* my consciousness," does he not mean that he is conscious *of* it? These all seem to be the same thing in a different form, allopathic or homeopathic, just as you wish. But if language can be twisted in such a manner, then not in language itself can be found the solution. The OF-ness has as much right to be primary as does the more direct expression. The problem is still unsolved,—it remains a dilemma. Let us see whether this antique dilemma hath not a third, rudimentary

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horn, the grasping of which will lead us permanently out of the pinch.

4. (b) That the thing may be a relayed form of consciousness does not solve the difficulty. All consciousness might turn out to be *re-presentative*, rather than immediate, the relayings differing only in complexity. We shall then appeal to logic as our old standby. The names of things are not the things, which every one will gladly admit, for the traveler lost in the desert cannot slake his thirst by the repetition of the word "water." If it had been so, the problem of the relief of the poor could never have been a university subject for which the student gets full credit. But to use the word "water" is not necessarily indicative that it is in the mouth of the user at the time. "Water" is the conventional English symbol for a liquid which, in some countries, is used to slake the thirst,—a word to which sensorial wetness pertaineth not. And the "meaning" of the word "water" is dependent in such a case upon what others will do when it is uttered. "Meaning," in psychology, at least, lies in what will be done in a situation involving the name of the thing *meant*. Meaning is therefore motor; it refers to functional sequences, and is an example of the "with-for" relation. Now, if words are re-

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lational, just as consciousness is relational, in that it is generated out of responses *to* an environment *by* a nervous system, then the old bugaboo of *re*-presentation need no longer be of any trouble to us. Every idea consists of positionless parts or properties of a thing. The use of the preposition in such expressions as "feeling *of*," "consciousness *of*," etc., simply indicates,—barring the linguistic fallacy,—that the thing so mentioned is one of the elements making up the conscious manifold, and nothing else. Otherwise, the expressions "unclear," "a minor element," or "sub-focal" provide for all cases in which it is ever properly used. The logic of relations thus accounts for certain elements in genetic psychology,—only the psychological aspect in language frequently swallows up the logical one. For when the logical orders get distorted by the introspective consciousness, and are reinterpreted by way of it, they suffer the lapse of their scientific validity. The introspective order is not the logical one, and the introspective consciousness is not in any sense the primary, immediate fact of consciousness. It is belated consciousness, and when too often referred to is indicative of an incipient division in personality.

5. The reason, then, for attaching validity

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to the expression, "consciousness *of*," is one of "informal" logic. But this does not apply to those relational states in which, as Professor Perry says, we "surround and surmount our past, incomplete experience." To say "I judge *that* I was wrong," is certainly a case of "consciousness *of*"; but the point to be made is that the "*of*-ness" in such an expression *ipso facto* defines its own non-immediacy or non-focality in consciousness. Furthermore, the point is to be made that one cannot have this *of*-relation occurring twice in succession. There is no "*of*-consciousness-*of*" anything, if by the expression we mean to link co-ordinate states of consciousness together. *I* may recall "that" *my* uncle mortgaged his house "when" *I* was a mere child, but the *I*'s and the *my* are very different things each time, bearing in psychology a subordinate relation to each other, and a non-reciprocal relation as well. Bluntly spoken, naively taken, these expressions have nothing dangerous in them, but the naive is not the systematic except by a *coup de Dieu*. The logic of introspection is informal logic: as Matthew Arnold would say, it "is eloquent, is well,—but is not true!"

6. We have been using the term consciousness as something already built up and guaranteed by responses, but not as something not

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yet functioned for or organized out of nature. Introspection is not the primary, immediate fact of consciousness because it is found only in a consciousness set a-brewing, and in this brew we find ourselves long before we first make wise inquiry after the nature of our being. For the "introspectional feltness" of a thing is no more sufficient to explain the origin or persistence of a thing, than the condition of being a debtor, will *ipso facto* satisfy one's creditors. Now, having cleared the logical grounds of all expected difficulties, we are ready to begin a systematic analysis of consciousness. We shall first treat of sensations and perceptions, and then of responses and meanings, including speech. Next we shall see what emotions and feelings are, following this with an explanation of interest, purpose and the creative faculties. Finally, there will be a brief but wide study of the ramifications of psychology throughout our practical, daily life. For psychological things are what we have to live with, if we live at all; indeed, other than by a perspicuous use of psychology, there is no escape from certain annoyances but by death, and this latter business is often a great inconvenience to our relatives. For them psychology remains the problem, surviving even if we do not.

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7. This is the program: First to analyse objects from the standpoint of their being sensed, and then to analyse the physiological sensing process. By this means we shall answer all three of the questions regarding consciousness,—what, how, and why. From the first standpoint it will be seen that there are two kinds of properties or attributes which give the sensation its thinghood: essential and inessential. These will be dealt with in the above order. Every one of the essential properties at least will be furthermore seen to be a *series*, and the sensation to be a cross-section of those terms of each such series which, while the sensing process is going on, are contingent in time and space. But corresponding terms in each series need not be present at the same time. For example, shapes, colors and distances are all series, but the moon which is at a certain point on the linear space series distant from the observer may be at no comparable point in the shape or color series, nor yet in the bigness series. Even some of these series are prime to each other. Furthermore, while the terms of these series making the sensation are contingent, they need have none but the loosest functional interdependence, not yet having the structure requisite for the formation of per-

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ceptions. It is thence that some of the informal logic of certain kinds of consciousness is derived. It is not here, however, that one finds any original "consciousness stuff"; for these various series are not generated by the consciousness relation, even if one should bolster up his argument by saying that continued fixation of a color appears to reduce its brightness.

8. Thus sensations have no substance,—they are not the ultimate brickbats of existence. But, added to this, two warnings. This does not mean that we, as human beings, are possessed of a special stability or specific gravity which, by comparison, makes the rest of the world inconstant, filmy and tottering; nor that when I rap on the table before me and say: "This is one of my realities," that I deny that the table is hard. Absolutely the contrary, beyond cavil and argument! A series can well be a series of hardnesses as well as one of preferences or divorces, and with this statement the philosophical program of this book must close.

9. Consciousness was defined for us as both a content and a process; some of its elements are likewise of this twofold character, and sensations are such elements. For instance, if someone holds up a patch of red in front of me

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and I see it, the red color is my content of consciousness, while the action of the retinal nerves guarantees the continuance of the sensing process. The retinal nerves do not become red, nor is it a reddish neural process which is going on,—it is a red-sensing process. However, on the content side, we have a red sensation, for while there is a functional relation between the neural action and the patch of color, there is an identical one between the object and the content of consciousness. In our discussion of visual sensations further on, it will be seen why, in the case of the color-blind person, the content is always, regardless of optical defects, to be asserted of the object. For psychology, an object is something that can stimulate, just as a rubber ball is something that will bounce, but the common name of the object is by no means a sufficient catalogue of its functional possibilities. If one were to enumerate all the things a certain object would do, he would then, but not before then, have a respectable estimate of what a sensation is. To completely exhaust it would require that it be, first exhibited; second, enumerated as to its properties; and lastly, defined as to its reaction possibilities in all situations where its effects made a difference to the outcome.

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10. But no dismay need accompany the reading of this last statement. The cases where it does make a difference are limited and known; at least if not fully known, known as to inveterate trend. The series has been plotted to its bounds, and whatever we lack is a term or two within the known range, if, indeed, we lack anything. Eighteen such terms, or attributes of sensation exist; seven of these are essential, while the remaining eleven are inessential. The whole eighteen never exist at the same time, it being a temporal impossibility, but whatever of them do exist at any instant or pulse of time, define the sensation for us, and at the same time exhaust it. Some of them are temporal, others spacial attributes; some are neither spacial nor temporal, but quantitative or qualitative instead: while all of them refer either to the content or the functional side of consciousness. Membership in one of these classes does not exclude the possibility of membership in another, but no single attribute is found in all six classes.

11. The Essential Attributes of Sensation.

(1) Modality. This is a functional attribute, referring to the sense field operating. There are no nameless sensations; every object is functioned for by some specialized group of

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cells,—the organ and the intra-neural connections; sight is one modality, sound is another, pain is another, and so on. There is, furthermore, no transition possible from one sense field to another; a prime relation exists between them. And while modality is functional, it is not quantitative, but qualitative. Ether waves, which produce lights, may be just another kind or degree of vibrations from those producing sounds, but they are even thus multifarious enough in their quantitative or formal relations to be called qualitatively different. Modality is not spacial or temporal either,—it is qualitatively functional, and that alone.

(2) Quality. This attribute refers to such things as colors, tastes, smells, tones, and the like, for every sensation is not only taken up by some sense organ, but within each modal range are various qualities; in some cases, such as tastes, very few, while in the case of colors, exceedingly many. Qualities are intra-modal, and as such, exhibit transition in some cases, but not in others. Thus a saline solution may, if the quantity of the solvent be increased, become a burning sensation, but never sugary or sour. Likewise, with the decrease in the proportion of the solvent, no other taste will be induced when the salty one ceases to be ef-

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fectual. Nevertheless, pure distilled water tastes slightly sweet. Quality is of course a non-spacial and non-temporal affair; it is a physical and meta-physical question as to whether it is ultimately quantitative. Ultimately for psychology, however, it is not.

(3) Intensity. This word refers both to content and function in sensation. Every sensation has its own specific intensity,—it is somewhere in the qualitatively intensive series. This series is non-temporal and non-spacial. Intensities cannot be added together arithmetically to produce a sum, just as no number of underseasoned dishes at a dinner will give the requisite flavor to it, no more than will the addition of pinks give a crimson. Intensity is always unique. We may not be able to tell how bright a color is, nor how intense the toothache, but the naive speech reaction is pragmatic and not specific, nor are all conscious contents open to steady inspection. As a functional affair, the intensity of sensation refers to the vigor of the transmission of the nervous impulse,—we are stunned by the detonation of the ordnance, or shocked by the electric current. Or, again, at the rose-carnival our own entries were not so red as those of another, though we once thought them superlatively so. Here, intensity is quan-

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titative; in many cases measurable by galvanometric methods. But it is not spacial, and not in point of rise and fall, temporal.

(4) Latent-period. This term is functional, and means the time elapsing between the application of the stimulus and the reaction upon it by the sensing organism. It is, therefore, solely a temporal phenomenon. There are also two kinds of latency,—focally conscious and sub-conscious, as follows: Rain falling on a sleeping soldier's upturned face on the battle-field might cause him to cover it without awakening,—without his being brought to the noticing or naming consciousness. This would be, of course, reflex action occurring after a sub-conscious latent period. If the soldier awoke, knowing and naming the rain, to defend himself from the elements, he would be said to be focally conscious of the affair after a latency ending in focal consciousness of the situation. In both of these cases, the latency would be defined in temporal terms,—i. e., as a time between the mechanical or chemical onset, and the movements of defense or speech, or both. Latency has much to do with intensity of the functional kind: it is, *caeteris paribus*, in defined situations, inversely proportional to it.

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But the intensities must be incremental to show this.

(5) Another derivative of intensity is the Threshold. Threshold is the functional *terminus ad quem* of the latent period. If, in the above case, the sleeper had moved to cover his face from the rain, some threshold of arousal would have been reached, the stimulation would have proved effective, and the with-for relation become operative. While being at the end of a temporal series, it is not itself a temporal matter, but rather a prime in that series. Thresholds are, indeed, measurable, but not usually by means of definite terms in the number series. Sometimes they are defined, as by Titchener, as those points on the intensive scale (mechanical measurements) where the sensation is aroused (noticeably, self-consciously) 50% of the time. This, however, is the better way to define them,—as having membership in a class of positions in the intensive series between those points where the sensation is noticeably aroused and those where it is not noticeably aroused; a decent illustration of which would be the area between two intersecting parabolas in the same plane. It is not a point, but an area, not such a quantity as 8, but rather 8 as any place between 7 and 9: the threshold is thus shown to

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be a quantitative tendency. Of thresholds there are two kinds, the upper and the lower. They are at opposite ends of the intensive series, and usually exist for both focal- and sub-consciousness in every modality. But the operation of the with-for relation certainly largely depends upon the focally-conscious aspect of the threshold, or limen, as it is often called.

(6) Duration is the chief temporal attribute of sensation. It can be applied to the period of time between the onset of the stimulus and its withdrawal, to the temporal extent of sub-consciousness, or to the focal-consciousness of the sensation. It is also functionally important for the intensity, considered as a functional attribute. We likewise speak correctly of the duration of the latent period. Peculiarly psychological is the report of the duration of a state of consciousness, in contrast, but not contradiction, to the amount of time involved in the physical presence of the excitant.

(7) The chief spacial attribute is Extensity. As an elemental attribute of sensation this corresponds very much to qualitative intensity. A pin prick is "smaller" in extensity than is the touch of a blunt pencil point; a toothache is also usually "smaller" than a sensation of nausea. It is not alone the functioning organ

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which makes this difference,—not alone the knowledge of the size of stimulus or organ, but an original and irreducible attribute of the sensation itself. Now, the extensive magnitudes are not absolute, but relative; they are a series, a scale, and we always make the estimation by employing terms of comparison. We cannot tell *how big* a sensation is, nor how much *bigger* it is than another one, but the psychological number system is of this kind, and one must be forewarned of it. It may well be, also, that the space of psychology is not Euclidian space, but a space very like that of a fourth or even an *nth* dimension. That it exists cozily along with Euclidian space, however, is scarcely to be denied.

12. To resume and further elaborate these seven essential attributes of sensation. One of them is spacial, extensity; two, temporal,—latency and duration; the rest are neither spacial nor temporal,—modality, quality, intensity, and threshold. As regards content, we have quality, intensity and extensity; as regards function, we have modality, intensity, latency, threshold, and duration. Intensity was also shown to be related to both content and function, while the functional character of other things, such as duration and latent-period, may

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frequently tend to induce qualitative differences in the content. As attributes of sensation, these seven terms illustrate the *attribute-thing* relation, mentioned and discussed in the preceding chapter. Duration, linked with intensity, functionally construed, as well as latency, refers to the *causal* relation, including as both do the temporal aspect. Now, while objects are material, none of these attributes are material, and yet an object sensed is often a material object. But just as physical and chemical analysis finds no brickbat-matter in the universe, neither does psychology: which, however, does not preclude that matter may not be the coagulation of non-material things. I fling the material stone at the material cat, but on the levels of physical and psychological analysis, qualities only tend to displace each other in the above act. The practical cat dies, let us admit; but the cat of analysis is merely redistributed: the stone is his passport to non-Euclidian space.

13. We now pass to a consideration of the inessential attributes of sensation. The rubric, inessential, does not mean that when they are present, they do not contribute emphatically to the then status of the sensation. They do, and as attributes they are constitutive in no small degree of the with-for relationship of the item

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of consciousness called sensation. A harmless analogy is the following: A household may consist of from two to n members, only two of which are essential; but the children, relatives, visitors and spungers all contribute to it, even if by hunger and fracas alone. In the following sections we shall take up the nature of these attributes from the standpoint of content, function, temporal and spacial significance, as well as relate them to the essential attributes just considered.

(1) Summation is the term used to indicate a number of applications of a stimulus before an arousal occurs. It is a temporal element, and functional. The heartless fly bites the sleeper's nose a dozen times before he awakens. Each stimulus, as a mechanical or chemical unit, is in itself insufficient to provoke the arousal, but as the result of repetitions near enough together so that the organ does not recover between times, summation is produced, the threshold is passed and the with-for relation firmly established in the defense. Bare intensity refers to one application of the stimulus; summation, on the other hand, means many (usually identical) applications. Summation plays a large part in quotidian affairs; "till seven times" is an expression based

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upon it, as well as the fact that a baseball team loses heart after the fifth or sixth successive defeat of the season, though their playing all along may have been equally poor. The sleep-meter that jangles us back into life in the morning, the final yielding of the maiden sister to the fatality of spinsterhood,—these are both summation. To some persons there seems to be a qualitative aspect to summation differing from that of an equable, supra-liminal sensation. It is more extensive, they say, and of a texture more subtle and more elusive; if so, it would be another case of psychological newness. As such, this “element” is adjectival.

(2) The after-image is that part of the object which survives the temporal extent of its application to the sense organ. The physicist witnesses summation in the number of shots a piece of ordnance will stand; he would likewise find positive after-images in echoes, at least in so far as acoustical effects are concerned. The “kick” of a gun might also be a sort of negative after-effect. Both of these are illustrated in psychological material, for there are two kinds of sensorial after-images, positive and negative. If we look fixedly at the yellow sun, upon turning away, greenish-blue blobs pepper the landscape. But if we gaze less long

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at an illumination of a milder intensity, the original colors are usually more faithfully preserved in the neural momentum. The after-image is qualitative and quantitative, depending upon many things, namely: intensity, quality, duration, extensity of the stimulus, and in pathological cases upon emotionality, intricacy of the situation, and even upon habitual lying or truth-telling. The after-image is not an illusion, but consists, in vision, at least, of but the shape and color of the object sensed, which, by the way, have no position, and may be anywhere.

(3) No sense organ functions without chemical changes within it, and when they become such as to impede the transmission of the impulses throughout the system, Exhaustion takes place. This is not the same as fatigue, which will be discussed under emotion. Exhaustion is a function of intensity, duration, extensity and certain plain qualities, specially smells. Curiously enough, also, the sense-organs are attuned to the reception of just so much stimulation, teleologically or not, just as either disputant avers. Leaving before the symphony is finished, drowsing through the missionary sermon, sleep, death, quitting college before the degree is conferred,—such cases

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usually exist by virtue of a complex in which it is more or less nuclear. We shall discuss its physiological side in a few moments.

(4) Adaptation appears to be a kind of partial exhaustion, and as such is a derivative of intensity; it is temporal, and in its different aspects, qualitative. In exhaustion the fuse is burned out; in adaptation there is a shunting of the current to a transmission circuit of exceedingly low potential. I call adaptation those cases of partial exhaustion where the sensation can be restored through attending to it or expecting it; exhaustion exhibits no such resurgences. The wearing of clothes, glasses, and the like, marriage, accepting life or death in the trenches, failing to notice how bad mannered we are, are cases of adaptation. Perhaps the "ship that found herself" illustrates it, as well as the fact that machinery runs better after a few hundred pulses than it did at first. But here the analogies run rather to seed and so we shall migrate to the next topic.

(5) Inhibition is a case where, for example, but one of two or more possible objects of a group gets functioned. It may follow exhaustion or adaptation, and appears to be a derivative of intensity. While intent upon our telephone conversation we do not notice that the

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fire-engine has clanged noisily down the street, though the sound it makes is physically intenser than the voice over the wire. Again, disagreeable table companions keep us from enjoying an otherwise satisfactory meal; or the fear of an impending final examination abolishes the memory of things we were positive we had at instant recall. Inhibition is a temporal and quantitative affair, and in psychology plays a considerable role. Indeed, one author, Muensterberg, regards it as the central fact of psychology.

(6) When two or more sensations blend so that each to a certain extent loses its independent character, the resultant is called a Fusion. This is a case of both psychological and logical newness. Fusion is both a process and a content. On the side of extensity it is sometimes easily comparable and again curiously incomparable to the elements from which it was derived. The discussion of the various sense fields will illustrate this. Fusion is partial, mutual inhibition; wherever it occurs, it is very likely to become adapted, and often seems to be a sop thrown to exhaustion. It will be seen later on to be one of the integral parts of perception. Language itself is a case of fusion. We do not think of the separate letters of words,

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but of the words as a whole; again, orange is obtainable by mixing red and yellow pigments, but it goes by a simple name and usually passes by unanalysed; the doctrine of the trinity was a theological fusion. Fusion and confusion are interesting to compare,—they seem to have many common parts. The latter term, however, refers to the meaning-side of the situation,—the degree of confusion implying the amount of labor it would take to make order grow where chaos did before.

(7) When, again, sensations appear together and neither inhibit each other nor fuse, we have a case of Contrast. This is a qualitative and sometimes a spacial attribute; it is likewise often a derivative of intensity. The chef applies chemical fusion to the making of the salad, while the hors d'oeuvre which preceded was concocted for the sake of contrast to it. The uses to which contrast effects are put are apparently unlimited, and yet quite closely related to certain definite principles of order. It would be more "stunning" to wear two gloves each of a different color, but we prefer in such a case bilateral chromatic symmetry; in fashions again, suits all of a piece are not disdained in favor of polychromatic clothing whether or no. Besides this, we may be passionately fond of

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change in many directions, and yet always eat the same breakfast, or walk to business down the same street. But where contrast effects are produced, each of the components more or less emphasizes the effect of the other. It is thus a case of the opposite of fusion in its two principal aspects. It is curious to note in what special ways it differs from inhibition.

(8) Clearness is predicated of the content side of a sensation when, in the midst of other sensations, it defines them in terms of itself. Thus it takes a relational aspect to provide the existence of this attribute. As we never get but one sensation in consciousness, there is always more or less clearness in the cross-section. Clearness and inhibition are closely related in this way,—the inhibiting sensation may be clear, the clear sensation always inhibits. To accomplish this, the clearness takes on the temporal aspect of duration, and through duration the inhibition gets functioned. In point of defining the context in terms of itself, this attribute has important bearings on perception. If it leads to inhibition, it relates itself to intensity; while, as it frequently appears to come from emotional backgrounds, it often loses its purely original qualitative and content aspect on this account.

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(9) Vividness is a compound of clearness and inhibition simultaneously occurring. Clearness defines the background in terms of itself,—in vividness we have a lost background, and an increase of intensity due not to the inhibitory crowding-out of the other contents, but of the sudden wilting of the conflicting functions. Crudely, it could be compared with a landslide to a certain political candidate by virtue (or vice?) of the withdrawal of his opponents, rather than to his own efforts in spite of them. This latter would rather be a case of inhibition. Physicists are acquainted with a half-brother to this attribute in some of the phenomena of refraction. In psychology, I am convinced, the index of refraction in the case of vividness is frequently emotional.

(10) The attributes of sensation may have no position alone, but the cross-section of their series takes position with reference to the object and the sensing organ: we call this the Local-sign (or Local-signature). I am touched with a pencil point upon variously functioning organs, and the name of the sense field comes with the touch (or other) sensations. We always report things as being somewhere,—not only in the case of sensations which arouse a unique quality upon various skin areas,—but so

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inveterately do we apply perspective to the contents of consciousness, that all things seem to have a place. And, in one sense, they do; dreams are in dreamland just as fairies are in fairyland. But, on the other hand, just as the non-spatial attributes of sensation are positionless, so are many of their combinations into things or wholes; especially is this true of the *part-whole* masses, of which dreams and fairies as well as logarithmic functions are examples.

(11) Some sensations are pleasant or unpleasant, and these terms signify Feeling-tone. This is an originally qualitative aspect, and nothing more; but there are grades of it, loosely called, for want of a better name, intensities. The nature of feeling is not as obscure as the dissertations upon it,—it is a function of certain equilibria,—neural, muscular, sensorial, and the like,—several variables, whose expected quotient is found to shrink in a surprising manner. For without the proper regard for the psychological *plus*, only nonsense arises from the addition of certain elements in the conscious cross-section. Psychology furnishes the basis for the empirical status of the irrational numbers in the above case, just as in fusions we find that to add is to subtract. In these, as in other cases to be met with, *nascitur*

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ridiculus mus is the authorized shipman's card. We are sometimes found furthering or hindering those sensation masses including pleasant or unpleasant feeling-tones respectively, but not always, for usually displeasure is more heavily socially subsidized than is pleasure, as is the case with error and untruth. These two feeling-tones are not incompatible psychological opposites, and when found together, they need neither fuse with nor inhibit each other, which is a curiosity. We have discussed the "position" of pleasure in a previous paragraph, and those authors who interpret feeling as indicative of the fact that the sensation to which it pertains is referred to the body rather than to the "external" world, are in error. What a dismal time others than ourselves must be having, according to this bit of wisdom!

14. The table on the following page will illustrate the relations of both the essential and inessential attributes to one another.

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I. ESSENTIAL ATTRIBUTES

Content	Function	Qualitative	Quantitative	Temporal	Spacial
1.	Modality	Modality	.....	.....	.....
2. Quality	.....	Quality	.....	.....	.....
3. Intensity	Intensity	Intensity	Intensity	.....	.....
4.	Latent-period	.....	Latent-Period	Latent-period	.....
5.	Threshold	.....	Threshold	.....	.....
6.	Duration	.....	Duration	Duration	.....
7. Extensity	.....	Extensity	Extensity	.....	Extensity

II. INESSENTIAL ATTRIBUTES

1.	Summation	Summation	Summation	Summation	.....
2. After-Image	.....	After-Image	After-Image	After-Image	After-Image
3.	Exhaustion	.....	Exhaustion	Exhaustion	.....
4.	Adaptation	Adaptation	Adaptation	Adaptation	.....
5.	Inhibition	.....	Inhibition	.....	.....
6. Fusion	.....	Fusion	Fusion	.....	Fusion
7. Contrast	.....	Contrast	Contrast	Contrast	Contrast
8. Clearness	.....	Clearness	Clearness	Clearness	.....
9. Vividness	Vividness	Vividness
10. Local-Sign	Local-Sign	Local-Sign
11.	Feeling-Tone	Feeling-Tone

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15. These eighteen attributes are the stuff of which sensation is made. They are attributes, rather than parts, and illustrate the *attribute-thing* relationship mentioned and defined in the previous chapter. As such, they *make up* sensation, for sensation, apart from their constituting, contributing relationship, does not occur. Thus it is incorrect to say that “a sensation varies,” for these attributes are all series, and as such alter in their changing the nature of the sensation they constitute instead of being altered *by* it. Sensational consciousness varies with its object, but, by virtue of our functioning a larger environment than that of the bare object of sense, reports upon its variation are obtained. From this it is likewise perceived that what the physicist means by “object” and what the psychologist means by it are apparently different things. In psychology, however, we use the word stimulus to indicate the physicist’s “object.” Sensation is more than stimulus. Sensation is the object, and what it will do; or, in other words, the psychologist’s “object” is the content and functions of a consciousness when within receptive range of the physicist’s “object” or stimulus. For neither can all of these attributes occur at the same instant of time, nor does the identity of the sensation with

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the object exhaust it. Surely the stimulus, as a physical datum, will affect other physical data in a way that differs from its directly affecting a nervous system; or it may have chemical properties, or a geological system to support. But in either case, the sensation is identical with whatever of the object is material for psychology. Series and properties only delimit the fields of the various sciences.

Questions on the foregoing:

1. Enumerate three common cases of adaptation and three of exhaustion not mentioned in the text. To what sort of stimuli are they referred? Tell in each case why you think the one attribute appears instead of the other.

2. "Quality" is under the heading "qualitative" in the above table. Can you suggest a better term than the latter in order that the same word need not be used in two senses?

16. I propose now to indicate what the nervous system has to do with sensation. Let me first lay down the principle that neural action is concerned more with the functions of consciousness than with its content. To be sure, we should never see yellow without a physiological eye, nor taste lemon without a tongue, but physiological psychology is the science of the functional maintenance of the content of

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consciousness rather than something concerned with the question of why we see yellow instead of red or taste lemon rather than lemonade. For the qualities of the content are implicit in any neural action at all, while the functional and quantitative series do not follow such an uneventful history. This may sound far from obvious, to say the least of it, and yet the whole history of psychology is befuddled with bulletins from Paddock, aggravating in their gloomy references to that moist bundle of strands within our bodies known as the nervous system, in which sensation, perception, emotion and reason were said to keep a hierarchy of thrones whose exact location was a perpetual discomfiture to the invading investigator. To be specific, there are, for example, but four simple taste qualities, while there are nine functional attributes of each of them. Now responses to the chemical stimuli known as tastes are restricted to these four qualities, but not in any way so attached to the functionally quantitative series of sensational attributes. Response, being a process, is therefore superlatively concerned with functional attributes: and to this we shall direct our attention.

17. A schematic representation of the nervous system would incline toward the shape of a

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funnel, the large end of which is located in the skull. Thence, thinning down, to the base of the spine, it ends as a notable, separate structure. It is, therefore, almost entirely posterior to the countenance. Just as visually we walk about headless, so we are never aware of the nerves as such. But from this central, funnel-like nervous system, there are prolonged innumerable and immensely complicated bundles of fibres, ramifying to all parts of the body, and varying from a fraction of an inch to five or six feet in length. Functionally, the mass of the nervous system does not assist us in understanding it. It is best regarded as a systematic set of strands, called cells. Let us be emphatic here, however, and take notice that the word "cell" does not mean a little, roundish affair. The cells of the nervous system are long, tiny strands, contrasting in shape with bone and other cells in the same way that a tall flag-pole contrasts with a chopping block. The functional construction goes farther. The physiological unit of response is not a single cell, but a set of at least three such long fibres, articulating in such a way that a stimulation, say, from the surface of the body will be carried as an impulse along all three of them in linear succession, and arouse at the end the

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release of energy required to make the stimulus effective. Such a linear series of nerve cells or fibres is called a reflex arc, and consists of three parts (the three cells) as follows: receptor, conductor and effector. The receptor starts with or *in* the sense organ, and extends to some part of the central nervous system,—brain or spinal cord,—where it ends as a fibre. But functionally it continues in the *conductor*, which interlaces it with the *effector*, whose further end is attached to a muscle by means of a little pad or end-plate. The action of this response mechanism is usually more useful to study than are pictorial representations of it, since they are all idealized. The best way to understand the scheme is to procure some nice animal, kill it, and trace out some special set of nerve fibres; for by this means alone the curious, angular character of the nerve-path can be appreciated.

18. The cell is primarily a white fibre. Somewhere along the fibre will be found a cell-body, colored gray; the term “gray matter” indicates that the cell-bodies are on the surface of the brains while below the surface in the spinal cord. There are about eleven thousand million of these nerve cells in the human body, each of which derives its nourishment from its

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own gray cell-body. They thus communicate impulses, but not food. The nerve strand has two sheaths, an inner or myelin sheath, and an outer, called the neurilemma. The function of these concern electro-physiology, however, rather than our own science. Special psychological interest attaches to the appearance and function of the physical termination of the nerve strands, one of which is the end-brush, the other, the dendrites. It will be noticed that the names are similes, and as such explain nothing functional. The end-brush of one fibre meets the dendrites of another, or aborizes with it; and right at this juncture psychology finds its chief interest in the nervous system. This is not to say that latency, for example, is unconnected with the rate of the nervous impulse, which makes it impossible for the "speed of thought" to be more than one or two hundred metres per second. Nor is it unimportant that the nervous action is chemical rather than electrical, even though the action of the cell is accompanied by electrical phenomena detectable by a galvanometer, and that there is chemical substance freed by the nervous action of response. Important as these are, they concern not intimately the conscious cross-section. But the fact that the change of the direction of the

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current through this neural arc is *irreversible*, and that it proceeds from sense organ down the receptor fibre, through the dendrites of that fibre across to the end-brush of the conducting fibre, and so on to the end-plate of a muscle ready to be aroused into changes of form, elasticity and the like,—this point is so important for psychology that we shall take it up in considerable detail. It is, indeed, the backbone of our knowing and doing.

19. Reflex action is the occupation of the reflex arcs. When one touches off a charged Leyden jar, incalculably more energy is discharged *from* the jar than was contained in the *mechanical* connecting of the two poles by the discharging wire. The release of energy in exploding dynamite far overtops the mechanical blow from the percussion cap. These are helpful analogies in considering reflexes. Reflex action means that more energy is discharged from the arc than was imparted to the organism by the stimulus. It also means that the “end effect is mediated by a conductor, itself incapable of mediating that particular end effect.” Furthermore, in all animals having a complicated nervous system, we find the reflexes defining the environment in point of being specifically and selectively excitable. Some respond

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but to grades of temperature, others to lights, still others to sounds, or to mechanical, chemical, electrical and other effects; and thus by their cross-sectioning the environment, unite in forming that which we call consciousness. There are, of course, other responses, such as, for example, those which calls from starving India would provoke, but these are not simple reflexes. According to recent investigators, the difference between the higher and the lower animals, insofar as neural action is concerned, lies in the fact that the unicellular organisms take but two chapters in physiology to exhaust them,—one on surface, and the other on internal phenomena,—while multicellular organisms supply a third chapter on intercellular physiology by virtue of intercellular deposits. Now when these deposits are solid (e. g., bone) we have mechanical or lever operations to consider; when they are liquid, we have chemical; and when, lastly, the intercellular connections are by virtue of real, living protoplasmic masses, whose business it is to connect, intercommunication becomes possible by reflex action. Now we can see why the foregiven analogies of the Leyden jar and the dynamite are going to prove psychologically inadequate. And yet mechan-

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ics has a finger in reflex action as will forthwith appear.

20. In the succeeding paragraphs, until we come to the detailed relating of the attributes of sensation to the action of the nervous system, I shall draw largely upon the work of C. S. Sherrington and others, as given in his "Integrative Action of the Nervous System," in which, by the way, is recorded the most significant information upon physiological psychology that has appeared for many centuries. The student will profit largely by studying some parts of this book in detail in connection with this present chapter. "*A sense organ is a receptive surface.*" From whatever parts of the body a reflex can be elicited, nerve fibres run to the conductor involved in the response, and those parts are the sense organ for that reflex. "The eye is a glorified heat spot, the ear a glorified touch spot." The long and eventful history of evolution traces the contraction of those sense fields receptive to ether and air vibrations to certain restricted areas, furthermore formed into organs which lie half embedded under apertures in the skin, neither strictly within nor on the surface of the body. Of stimuli that will excite the reflex chain implicit with the presence of a sensory surface there are four

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kinds. The first and largest class are the effective stimuli, by which is meant all means, mechanical, thermal, chemical, etc., that will start neural action along the arc. Of these effective stimuli, however, some are adequate, or those to which the organ is normally attuned, such as sight to the eye, sound to the ear, and so on; while others are inadequate (let us say for true perceptions) such as a blow on the eye, or a foreign substance in the ear. All other stimuli are ineffective, that is, cause no arousal whatever, such as a beam of moonlight streaming into the ear. Considered from the standpoint of modality, the sensory reflexes define a modality of adequate stimuli only, the blow on the eye being a mechanical jar, transmitted to the optic nerve not by the retina but by a sequence of concussions through the coats and liquids of the eye-ball. The sensory surfaces are thus selective. Sherrington reports that the plantar reflex of the brainless dog and the pinna reflex in the cat can be elicited by only mechanical stimuli. Electrical are wholly ineffective. As a last general word on the receptive surfaces, it is found that if we consider such field as that whole collection of points on the skin from which an identical reflex may be elicited, that a *weak* stimulus in the center of the field

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has about as much of an effect as a *strong* one on the periphery. A schematic representation of a reflex field would have to include the item of varying penetrability.

21. Some reflex fields overlap. Especially is this true of the so-called proprio-ceptive and the extero-ceptive reflex fields, the former being the sub-cutaneous receptors for organic stimulation, while the latter are on the skin surface, or superficial. The dermal senses exhibit this overlapping all the while, and in experimenting on touch, one finds that most investigation is meaningless without taking account of this fact. Thus for the modalities known as touch, warmth, cold, and pain, there is a rather illy defined set of dependable reflexes for functioning them. Sometimes, also, there is interaction between overlapping sense fields, setting up a new condition in their relation, known as the "reinforcing of reflexes by each other." This has bearings upon intensity, both qualitative and quantitative. Sometimes reflexes widely apart (dermographically) combine and interact, as in synaesthesia, by which is meant the co-presence of the qualities of one object (the stimulus) with the presence of those of another object of a normally unrelated modality. This is especially instanced by the

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musician who has his "white" and "blue" minor tonalities.

22. Reflexes also are set off in certain sequences. The sight of a fly causes a hungry frog (doubtless visually more alert through hunger) to dart out its tongue, the movement of the tongue arousing salivation, which again leads to the business of swallowing. The stimuli to such reflexes usually overlap each other in time, and the threshold of excitability of each succeeding one is lowered by the excitation just in advance of its own. It is almost needless to say that most of our learned habits are of such a sequential reflex character, called *con*-sequential when the with-for relation is present. As a rule, furthermore, the series is intransitive, which is exactly what irreversibility of the transmission of impulses along the neural arc must be understood to mean.

23. Curious among the reflexes are those whose response functions pain. The pain sense organs are "anelective," that is, their modality includes exceedingly heterogeneous objects. Very many kinds of stimuli are painful. And if the stimuli are normally inadequate, when danger to the whole organism is threatened, they become adequate,—that is, the threshold is then very low. Especially is an exposed

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nerve susceptible to low intensities of noxious stimuli, and as such represents the imperatively protective character of the pain reflex. The pain reflex exhibits another curiosity in point of being aroused, for example, by a harmful touch on a certain spot of the skin, where a harmless touch would be insufficient. The resulting actions, likewise, from these two characters of stimulus are diametrically unlike.

24. Our fund of health is guaranteed by an immense number of tonic and other reflexes. The vegetative functions, cardiac, respiratory and other valiant reactions against an environment we propitiate by metabolism, guarantee a certain vital momentum,—on the basis of which we are free to function extero-ceptively,—and depend for their integrity upon retaining their receptive surfaces, modalities and thresholds intact. In a way, we might be said to thrive principally upon the funded increment of the *unconscious*, for only by means of the warnings of pathological symptoms do we recognize the stabilizing character of these background reflexes of our organism.

25. All the reflexes may be said to be purposive. That is to say, they maintain the animal against some, maybe not the choicest, portion of his environment. For those parts which,

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in a case of danger, cannot withdraw, evoke by mediation of pain reflexes those which can effect a withdrawal. Sherrington also points out that the scratching by a dog of his own bitten skin grooms the skin so as to protect the sensory surface against becoming of too high a threshold value for the inevitable noxious stimulus.

26. After this brief account of reflexes in general, we turn to the specific relation of the reflex arc to sensation and its constitutive attributes. It will be remembered that the three strands in the nerve path were the receptor, the conductor and the effector, each of which has a different function. As may be already in mind, the function of the receptor is implicit in an adequate description of a receptive surface. But to go farther, the function of the receptor (fibre and sense organ together) is "to lower the threshold of excitability of an arc for one kind of stimulus, and to heighten it for all the others." In our own terms,—to specify more and more the limits of the modality. For example, there are no *electrical* receptors: nature excludes volts and amperes from the list of adequate stimuli,—from modalities. But the selective excitability of the receptor not only limits the number of stimuli within the mo-

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dality, but provides increasing responsiveness to them, and heightens it superlatively for a special few. As far as the effector is concerned, it is connected with the muscle on its end-plate, and the end-plate is indefatigable. No amount of stimulation exhausts it,—it has no threshold.

27. But when one asks what happens in the conductor, the array of facts and functions is not so abbreviated as in the above cases. Now if, instead of stimulating the sensory surface of a reflex, we dissect in under the skin to the nerve trunk, and, leaving the receiving organ out of the experiment, stimulate a conduction path, the results will differ from those derived from intact reflex arc conduction in the following ways:

“Conduction in reflex arc exhibits, (1) slower speed as measured by the *latent period* between application of stimulus and appearance of end-effect, this difference being greater for weak stimuli than for strong;

(2) Less close correspondence between the moment of cessation of stimulus and the moment of cessation of end-effect, *i. e.*, there is a marked “*after-discharge*”;

(3) Less close correspondence between the rhythm of stimulus and rhythm of end-effect;

(4) Less close correspondence between the

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grading of intensity of the stimulus and the grading of intensity of the end-effect;

(5) Considerable resistance to passage of a single nerve impulse, but a resistance easily forced by a succession of impulses (*temporal summation*);

(6) Irreversibility of direction, instead of comparative unfatigability of nerve trunks;

(7) Fatigability in contrast with the comparative unfatigability of nerve trunks;

(8) Much greater variability of the threshold value of stimulus than in nerve trunks;

(9) Refractory period, inhibition, and shock, in degrees unknown for nerve trunks;

(10) Much greater dependence on blood circulation, oxygen; and

(11) Much greater susceptibility to various drugs—anaesthetics.”

I have italicised several words in this quotation for the purpose of showing the trend of my interpretation of the nervous system; and it will be noticed also that these eleven points of difference sum for us into a general concept of something like a *blockade*. And the place where these blockades occur has been quite clearly indicated to be not in the nerve cell bodies, nor the sustaining tissue between nerve fibres, but in the surfaces of separation be-

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tween the end-brush and the dendrites, called the *synapse*. Now a surface of separation is physically a membrane,—the nerves do not conjoin any more than the fleshy surfaces of the hands touch when one clasps his gloved hands. Correlated with the irreciprocal permeability of the synaptic membrane is the irreversibility of the nervous current,—a phenomenon well known as a phase of osmosis. Now the nervous conduction is not preeminently chemical, as is witnessed by the facts of its speed, freedom from the effects of temperature changes, and its facile excitation by mechanical means. Right here, then, is where mechanics and physics come in for their own in psychology. In order that a transverse membrane become a conductor, it must be modified by doing the conducting, and such we find to be the case with reflex conduction as differing from nerve trunk conduction. This feature defines many of the phenomena of physiological psychology as types of auto-catalysed neural activity, and has no end of bearings on personality.

28. We are now ready to indicate the relation between the attributes of sensation and neural activity. Of the first two essential attributes, modality and quality, we have sufficiently spoken. The next in order is inten-

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sity. The first point to make is that the intensity of effect is less well graded with the mechanically measurable stimulus in the case of the intact reflex arc than in the nerve trunks. In the latter it is almost a one-to-one correlation, while in the former it looks like all or nothing. So that internal neurological conditions play a greater role than do external ones in reflex conductions as compared with those in nerve trunk conductions. Especially is this to be noted in the different grading of effects in various reflexes. The series are not ordinarily correlated either. And yet intensities in these cases are connected with the number of elements coexcited, acting by irradiation. However this may be, the reaction, as it irradiates, treats the motor element, the effector and its connections, as a unit. For the whole motor center functionally belongs to each and all of the groups of receptors proper to the reflex. Much light is thrown by this knowledge of the working of reflexes upon both the qualitative and quantitative aspects of intensity. Unless we are merely sparring for time, the uniqueness of qualitative intensity means in connection with reflexes, that the "all or nothing" principle implies too sudden an inlet and outgo of energy for any intercolonial responses to

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furnish an equilibrating neural background at the time of the release of reflex energy; while the quantitative and functional aspect of intensity lies unconcealed in the two principles of irradiation and differences of grading in the various reflexes. This grading is found to be a constant function, but its mathematical expression is far from being reducible to a simple linear equation: its formulation includes at least two dimensions.

29. In connection with the next attributes of sensation to be disposed of, it is requisite that we consider briefly certain characteristics of the release of neural energy in the effector nerves. Sensory surfaces, as we have just seen, may be very large or very small, but in either case the sensory (receptor) fibres leading from them pass toward some part of the central nervous system, there to be gathered together in a bundle to guarantee that the response mechanism shall not be at all hit or miss, but rather specifically differentiated from that mechanism fed by the sensory fibres from another sense field. Now, however, several sense fields frequently are connected by receptor fibres to the same effector mechanism, so that the stimulation that gets there first will close the "valve" against the later arrival and crowd

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it out of action. The simultaneous or even successive debouching of nervous energies upon the same undischarged effector does not behave always in the above manner, but whenever any effector amenable to neural discharge from several sense fields functions in this way it is called a "final common path." Before the final common path is reached, however, at least one synapse has to be passed, and the condition of passage at this surface of separation is of such a character that sensory selectivity is very simple and easy to comprehend in contrast to the eccentric character of the release readiness at the entrance to this final common path. The motor cells do not conjoin. Only a functional union knits them together, and here in connection with this neuronie threshold of release we may freely mention all but a few of the remaining attributes of sensation,—not only mention them, in fact, but at the end propound a very searching and insistent question.

30. Intensity has been shown to concern the release of energy all along the neural arc. "The entrant path tends to run in certain directions or not at all," for other paths may lead to the same conductor and the two sets of forces may conflict. Then, either irradiation or *summation* of stimuli must overcome the neuronie

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threshold, "and irradiation extends *per saltum* rather than *ad gradatim*." The strongest stimulated afferent arc is the most likely to capture the final common path,—strong and weak referring not only to mechanical or other stimuli as such, but also to the relation they bear to the focus and fringe of the receptive field. Typical of the sort of data the psychologist must not haggle over, is the fact that the threshold of excitability in the reflex mechanism is more variable than in the nerve trunks. Stimulation in the undissected animal is, *pro tanto*, destined to be more eventful than that in the mutilated specimen. There is in James' "Psychology, Briefer Course," (pp. 92-101), an account of the behavior both of a mutilated frog and of a pigeon, in which the differences between them and their whole fellow creatures is taken up in considerable detail, just in point of what the neural connections contribute to consciousness, as we are doing here, with a conclusion that I am certain is in serious error. I shall quote just enough of this chapter both to be fair to its author and to make my point: ". . . the main difference between the hemisphereless animal and the whole one may be concisely expressed by saying that *the one obeys absent, the other only present, objects*." Again,

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“Within the psychic life due to the cerebrum itself the same general distinction obtains, between considerations of the more immediate and considerations of the more remote. In all ages the man whose determinations are swayed by reference to the most distant ends has been held to possess the highest intelligence.” I cite this much quoted expression right here, even at the risk of losing my reader’s memory of the issue I have started to make pertinent for him, for the exact purpose of showing just what inadequacy has characterized many a psychologist’s treatment of neural connections. For not only are there innumerable *present* objects and *immediate* considerations which even the whole, undissected animal cannot obey or respond to,—on account of the selective excitability of the neural arc and the neuronie threshold,—but there are also recent investigations upon dogs, by Goltz, Pavlow and Rothmann, showing that new tricks, habits and memories may become the possession of animals with spines transected and brains dissected out. Let any one make out of this whatever he pleases, remembering also the nudge we gave in a previous paragraph regarding the heirarchy of dark thrones in the wilderness of the central nervous system.

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31. Due to the energy required to overpass the neuronie threshold, not immediately upon the application of the stimulus does the release occur. But the *latent period* (refractory phase) in the nerve trunks is only about one sigma (one-thousandth of a second), while in the case of the reflex arc the pause is considerably longer and more variable. Besides, in the latter case it often "misses a stitch,"—the effect of the stimuli thereafter being poorly graded with the amount of mechanical or electrical stimulation. Something is happening, nevertheless, in the refractory phase, which is only "that state during which, apart from fatigue, the mechanism shows less than its full effect of excitability." The *summation* of stimuli also "produce a condition at the synapse similar to that normally present in the nerve trunk." This phenomenon is not due to the muscle, but is wholly a reflex arc affair. Very feeble electric shocks will summate, and one weak stimulus followed by another one as far apart as 1400 sigma (1.4 sec.) may summate with it. This phenomenon further means that "the nearer together two points are in the receptive field which get stimulated, the greater coalition there is between the reflexes elicited." For "where conduction lines run together, there is a reduction in re-

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sistance," and this is primarily what summation means. At this point we may also speak of *vividness* and *clearness*. When an "initial reflex is followed by an incremental one, the latency of the latter is shorter than that of the former." The synapse was "set," and the qualitatively different, but modally-prepared-for stimulus got functioned on the background of this neural readiness.

32. The final common path being captured, *adaptation* may set in; in which case less energy from the stimulus will be then needed to produce a release equal to the original reaction. The bridge is built, and merchandize may be shipped across it *ad libitum*. "The length of latency being inversely proportional to the reflex intensity," before the synapse is "set," there follows in cases of *adaptation* the maintenance of a transmission circuit at the expense of very little energy from the stimulus. In conduct we call this feature "poise." The final common path is a common conductor for many impulses, arising from many sources of reception. When impulses producing allied rather than opposed effects play upon it, we have a case of *fusion*, which is summation minus the time element, considered from the standpoint of reflex readiness, though the qualitative character of the

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fused elements is apparently a derivative of time itself.

33. Linked with the amount of receptive surface stimulated is the attribute of *extensity*. It appears now why this and other attributes are referred to content rather than to function. For if fusion exhibits the fact that in psychology to add is to subtract, *extensity of receptive field* or surface needs not go hand in hand with summation of releases or end-effects. This very item indicates the different dimensionality of quantities and qualities. Yellow, for example, is not just a certain number of vibrations. It is also yellow,—the physics of color defines not that other dimension into which the concept of color is embedded. So with *extensity*: we might even add *contrast* to the list, for the items of sensation in regard to which we have to be exceedingly perspicuous and rigidly empirical began as far back as the paragraph on the neuron threshold. Contrast is represented, or better shared in neural-arc releases by an enlargement of the concept of the neurology of fusion: I mean the simultaneous and balanced use of final common paths for allied effects, even within different modalities.

34. The receptive surface of a reflex has bounds, and functionally thins off in a manner

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specified before. The *local-sign* of an object stimulating it will then more accurately correspond to its position in space, the more orthogonally it impinges upon that field, functionally considered. For an erroneous judgment in terms of local sign means only a certain obliquity of stimulus in relation to the field as a receiving apparatus. This concept will be elaborated in the paragraphs on illusions.

35. The attributes of *duration* and *after-image* are best treated of together in connection with neural action. We saw that the latent period included the element of time. These do also, but in the following special manner: Sensations, qualitatively construed, may endure as long as, not as long as, or longer than the application of the stimulus. Indeed, the latent-period implies that the effector fibre shall release its energy later than the receptor; after-images merely require the concept of more sluggish time without necessary diminution of effect to explain them. For, as formerly asserted, time in psychology is not solar time, and for the differences no one on an empirical mission needs to make any apology. We find that the after-discharge of reflexes may be very incalculable. It may be, for example, the same for nine stimulations as it is for three stimula-

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tions, each of which is mechanically thrice the quantity of the one used nine times. Or, again, after a number of subliminal stimuli there may be a pause without discharge, but during which the stimuli are summing, followed by a vigorous discharge, then another pause, then an after-discharge,—a thing not so different after all from one's experience with induction coils and Leyden jars.

36. Exhaustion is a function of time and intensity. As a reflex tires from excessive stimulation, it not only declines in the amount of release of motor energy, but becomes also more and more markedly tremulous. Opposed to this effect is that of an adapted reflex, as noted above. Exhaustion is also a function of position or direction. Some reflexes which tire when aroused from one spot in the sensory surface, can be aroused again to full activity by stimulating another spot some little distance away. With judicious use, the reflexes are relatively indefatigable; for by the shifting of briefly lasting stimuli from point to point in the field, one can produce a longer lasting reaction than when the same stimuli come at equal intervals at the same point. Now in spite of the fact that reference to the sensory surface is a great factor in exhaustion, the phe-

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nomenon is not sensory, but directly referable to the conduction fibres within the central nervous system. But here we have to include the fact that "only when" the sensory surface is treated thus and so does the internal conductivity become involved in the manner so far shown.

37. Inhibition is manifested in the reflex arc action in many ways, some of which are quite curious. We have spoken of the incremental reflex,—where the second, say, of two stimulations being suddenly intensified, arouses sudden intensification of the motor result. In such a case, whenever there is a latent period other than one might expect for such a change in intensity, it means the checking, or inhibition of spreads of discharge to other centres than the one concerned with the discharge into the final common path then in operation. Again, the after-discharge may be prevented by stimulating another reflex which uses the same final common path for an effect contrary to the first one. What else, also, is the latent time itself than a period of inhibition? But we usually speak of this phenomenon as occurring *after* the inception of some other fully opened discharge mechanism. Now come the curiosities. Reflexes of a simultaneous double sign

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(that is, where the motor nerve of the extensor muscle of a limb and that of the flexor muscle have opposed end effects) are neither exclusively excitatory nor exclusively inhibitory. Besides, certain other reflexes are purely inhibitory, (that is, they are nihilistic in character,—dogs in a manger). They check all end effects possible, producing none but those of their own release. Inhibitions usually also leave the nervous tissue better fitted for more extensive functioning after their occurrence, though some are neutral, leaving the tissue neither exhausted nor surcharged as to energy.

38. There is but one more attribute of sensation to be considered in this wise. This is *feeling-tone*. It was suggested previously that not quite all the data of sensation could be harnessed to neural action, and this intricate and mooted point of the neural nature of feeling now confronts us. These other seventeen attributes are all accounted for by intra-neural categories; feeling-tone must be accounted for by means of inter-neural relationships. But the problem is not acute: in case of the readiness of an arc to respond, or in case of the readiness of transfer of energy from one arc to another, or in case of a readiness to inhibit,—such items as these sum up most of the neurol-

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ogy of feeling-tones. Whatever other empirical conditions may be found to be the bases of feeling will, of course, but plot other points in the same series. We like not only to be doing, but also at times to keep ourselves and others from doing, as well as we like changes and novelties. That these are implicit in the general neurology of sensation is evident from a careful perusal of the above explanatory and analytic paragraphs.

39. But now there comes an insistent question with regard to all the foregoing. Is what the nerves are *doing*, sensation? And are the attributes of sensation which are carefully and completely welded to neural releases to be taken to imply that the sensation *is in* the nervous system? Is the fluent speaker after all only emptying his spine and cranium upon his hearers? For it is exactly at this point in most treatises upon things mental, where psychology meets its unpremeditated Golgotha. And here a large two-horned dilemma pokes its nose over the horizon, for there seem to be but two alternatives from which to choose in this and every other similar case. One of which dilemmas I have elsewhere in this book called the gospel of dendrites; and the other of which I shall have no trouble in allying to the theory

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of soft souls. The gospel of dendrites asserts that sensations are in and of the nervous system exclusively. My preceding paragraphs, with the exception of a few phrases about series, (odious and sour to the hide-bound physiologist), are welcomed no doubt by the upholders of this doctrine, and they point with triumph to the harnessing of every last attribute of sensation to the internal workings of the body. "*There the sensation is,*" they say, "it is just what the nerves are doing." The other party, breezing forth the doctrine of a soft soul, retaliates vigorously upon the preceding by asserting that the neural action heretofore described has nothing to do with sensation as experienced. "It doesn't feel that way to look at yellow, nor to taste lemonade, nor yet to be pricked with a pin. The experiencing of things is unique, and all your nervous action and conceptual series are preposterous and artificial."

40. But both of these objections come about through a clear case of total misapprehension. It was not a dilemma that appeared above the horizon, but merely a unicorn, which only to the strabismic showed a bifurcated frontal excrescence. And I shall treat of these two doctrines in exactly the inverse proportion to their pop-

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ularity. In the first place, the gospel of dendrites gives no sufficient account of the object stimulating the arcs. In the second place, the theory of the soft and elusive soul spurns all identity between that which sensations can be analysed into (attributes) and the characteristics of neural action as shown by investigators who, by the way, do not thus cavil at what they find to be the case. For to speak introspectively about sensations in any manner except simply to blurt their names and their immediate effects, is to use memory and judgment, which are not sensations. But then, the hopelessness of persuading the soft-soul theorist against his assumptions is worth nothing in comparison to keeping others from becoming so unregenerate as he. Of course the object is not the neural action. When we ask, as Holt asks in regard to reflex activities, "*What is this organism doing*" in the presence of the fateful stimulus? the answer, if complete, can neither be in terms of the neural release alone as tested on laboratory specimens, nor yet in terms of the object we care to assert is the only possible potent object within range of the nervous system; but our answer must rather be, that "the organism proceeds to do something, of which the strict scientific description can only be that

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it is a constant function of some feature of the environment; and this latter [the environment] is by no means necessarily the stimulus itself." ("Response and Cognition," by E. B. Holt, Jour. Phil., Psych. and Sci. Methods. July 8, 1915.)

41. The physiologist cannot, with a mere wave of the hand, banish all other objects than the one he is especially interested in testing upon the organism. Neither is the soft-soul theorist putting away nonsensical things in asserting that the object sensed is not the object as described; for when he says "sensation," he means "object in an environment colored by the environment." Of course he cannot understand why you are talking about one thing when he is thinking about fifty. So that it is neither neural action that is the sensation, nor yet the "experience" which no one can mention, but *the sensation is the object and what it will do in that environment to accomplish the release of energy in the nervous system*. And these two things, what it *is* and what it *does*, while unseparated in that which the soft-soul theorist calls his "*experience*," have just been separated in this treatment of sensation. This point exhibits an explicit case of the with-for relation; things and doings are blended in unanalysed consciousness,—blended to make consciousness,

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—and it is upon the basis and according to the character of these blends that we ever thought of using the pronoun I.

42. But lest I be misunderstood at this juncture, let me say that, insofar as the neural action is concerned with the sensation, *it is identical with whatever of the sensation can be defined* by reference to the attributes constituting it. Some of these attributes are also identical with the object, the stimulus. In adaptation the nerves are becoming adapted to the continued release of their energy; in summation, they sum their effects, and so on throughout the list. Sensation, however, is made by an *object within an environment upon nervous arcs within the eleven thousand million cells of the system*. The object is not cleft from its environment nor are the specialized arcs separated from their gray and white bedding. For the attributes that refer to content are *of the object* as well as exhibited in the response, and partial naming of them with reference exclusively to one or the other is fallacious. Mind and body are the same thing, and of the attribute-thing character; only the possible attributes are not ever all together in time or space, since the orders to which they belong forbid such a condition.

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THE SPECIAL SENSES

I. Internal

43. Typical of the internal sensations and doubtless of prime importance to the reader is the sensation of *hunger*. This sensation is to be cleft from appetite, for the desserts we eat are not taken to satisfy hunger, but merely to please us. Furthermore, hunger often forces people to take food when it is both distasteful and nauseating. It is specifically characterized by "a dull ache or gnawing localized at the lower mid-chest region and the epigastrium, becoming more local the intenser it becomes." This dull ache is also accompanied by lassitude, drowsiness, faintness, headache, irritability and restlessness at times, these being the inessential concomitants of the sensation. It is not a general somatic condition, nor is it due to nerve cells "suffering from a shortage of provisions," for after the first few days of a fast, hunger wholly disappears. The absence of hunger in fever, that there is no evidence for the sudden changes in the blood corresponding to the sudden and intermittent onsets of the pangs, and the fact that hunger is gone too soon after eating for the replenishments it provides to become effective, together with the illustration that to eat moss and clay, indigestibles that they are,

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allays the pangs,—these point to a special location for the stimulus. Neither is it due to emptiness of the stomach alone, nor to the turgescence of the gastric glands, for after one swallows indigestibles, causing no secretions of gastric juice whatever, hunger is assuaged.

44. Hunger is rather the “result of contractions of the muscle fibres of a wholly empty stomach” (in health), and “such contractions may be even stronger than during digestion.” This has been shown by means of detecting manometric contractions caused by rubber balloons connected with tubing temporarily swallowed and allowed to be inflated so as to receive the impacts of the stomach wall. The fact that hunger is often felt higher up than at the stomach is accounted for by the similar finding of synchronous contractions in the lower oesophagus. The cause for these contractions is not known, but writers incline to the view that habit rather than specific bodily need causes them. The expression “too tired to eat” means that fatigue poisons in the blood relay their effects to accomplish a fatigue in the rhythmic contractions of the digestive organs involved. Professor W. B. Cannon writes: “Hunger, in other words, is normally the signal that the stomach is contracted for action; the

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unpleasantness of hunger leads to eating; eating starts gastric secretion, distends the contracted organ, initiates the movements of gastric digestion, and abolishes the sensation." Now the curious thing to note in this sensation is that the stimulus is not the stomach, nor the empty stomach, but the qualitative and quantitative character of the *movements of that organ*. If the introspector says that hunger is nonsense when reduced to movements, (just as he would say ether vibrations are a silly substitute for yellow), the reply is that the sensation hunger is the object and what it will do, just as with every other sensation in the conscious cross-section. Only the experience of hunger is just another qualitative attribute of just such movements and nothing else; for the physiologist from whom I have just quoted would likewise be the last man to say that when the stomach contracts all one has in mind are the graphical results of the manometric measurements.

45. The other internal sensations we shall not consider in detail. Except in diseased conditions the intestinal organs can be burned, pricked, cut or pinched without any result for focal consciousness. The peritoneum and diaphragm, on the other hand, as far as experi-

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ment has gone, show extreme responsiveness; yet the various attributes of sensation have not been systematically studied in them. Thirst and nausea are usually localized in the mouth and throat. As a usual thing we are not conscious of the action of the heart and lungs, any more than we are of the other viscera, and, indeed, only by those feelings known as aches and pains do we become at all aware of the unconscious backgrounds of focal consciousness. And these aches and pains are frequently intensities, summations, extensities, durations and the like of coenaesthetic disturbances, constituting the with-for relation of general and specific defense against disease and thwarting. The psychology of these things, when thoroughly investigated, will prove of interest to all hands, but their special study is for the pathologist rather than for the student of general psychology.

2. *Cutaneous Senses*

46. The next group of sensations we shall consider are those functioned for by organs in the epidermis. These are commonly called touch, pain, warmth, cold, the pilomotor reflex, tickle, roughness, smoothness, and the like,—some of which are fusions and summations of other sensations. The area known as the “sur-

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face of the body" is defined as extending as far within the apertures of the body as the normally "skin-senses" can be aroused. In connection with all these dermal senses two things must be diligently kept in focus: first, the character of the mechanical or other stimulus used, and second, the various layers of organs of sensibility beneath the skin surface. As said before, sensations are objects, and there are not sensations *of* these objects; so that later on, when we come to the possibility of arousing a sensation of warmth by a cold file the student will have no need of invoking the artifacts to help him over the seeming difficulty. In this connection it will be seen just how important the nature of series becomes in the science of the conscious cross-section.

47. The organs for the cutaneous senses are in general bulb-like. In and about every hair follicle fine nerve fibres wind, thus making the organs for superficial touch,—that is, the characteristic sensation aroused by a pin-head or a medium-sized bristle moderately applied. The formation of the touch-bulb is not unlike a rather amateurish piece of splicing. Cold is functioned for by other end-bulbs, of a roundish appearance, while warmth is transmitted by a cylindrical organ, deeper in the layers of

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the skin than that for cold. Other disc-like organs have been located in the deeper tissues, whose function is not as exactly definable as that of the others. Pain is connected with the sensorial functioning of the free nerve endings, and has no specialized organ, insofar as evolutionary shaping is concerned. The skin does not respond to thermal, mechanical and electrical stimuli homogeneously, but is a mosaic of tiny areas, some of which respond to touches, others to temperatures, and still others to punctures and the like. But the interesting thing about the integumental sense field is that the same areas or spots remain constantly of the same character, so that we can factually say: "Once a touch spot always a touch spot," and so on. Of these spots, those responding painfully are the most numerous, cold and touch spots come next, while the warmth spots are the fewest. Punsters might infer from this condition both that "man was made to mourn," and also that nature had some hand in the size of the coal bill. Exploration of the entire integument has also shown that these spots are unequally distributed, in general the most sensitive parts being over the joints and upon those areas uncovered by clothing. Special articles on these points will have to be referred to by

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the student for further and exacter information.

48. As a signal example of clean and significant experimentation upon the skin surface, is to be mentioned the work of Drs. Rivers and Head, as recorded in "Brain," Nov., 1908, in an article called "A Human Experiment in Nerve Division." I cite this article also for the purpose of showing that naive experiments performed in laboratories result in findings contrary to those which appear in text-books, because of lack of definition in the materials used and the method employed. Dr. Head found three separate sets of organs located in the dermal layers, each of which behaved quite differently upon the application of the same stimuli. And in this case, as before, one must be ready to resign his old idea of the nature of sensation, and distinguish between the *physical* nature of the stimulus, the *functional* nature of the neural release, and the nature of *what* the organism is *doing* in the presence of the environment. For while we get yellow when looking at the sun as a conscious content, we get touches, colds, warmths and pains when the same shaped stimulus in different physical series is applied to the skin. Only persons who are eye-minded think of needles when their

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skin is punctured. The thing known as pain is not the essence of needledom; for the abstracting of a hair from the skin will also cause pain, just as the tapping of a cold spot often arouses the sensation called cold. We shall speak of the identity of series in these various contents and processes after the following brief summary of this article cited above.

49. There is an area of deep sensibility, independent of cutaneous nerves, which functions as follows. Tactile (pin-head) pressure is present in it, which even deep freezing by ethyl chloride does not abolish; but the application of cotton wool and the pulling of hairs outwards produces no focality in consciousness. Sudden jars and slight gradual pressures, however, are each differently responded to, thus indicating that the content of consciousness subtends respectively the different kinds of intensity involved. Roughness is well functioned for by this deep-lying system of nerves. Pressure, which to a normal hand would be painful, is present in consciousness as an ache, while needle pricking and electric pain arouse nothing there at all. Local sign is curiously prominent, even after freezing, but two compass points as far apart as 6 cm. laid longitudinally to the axis of the arm are not distinguished. Yet upon the

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application of the points successively no such results are obtained. Temperature is wholly absent, only numbness being reported after the application of cold silver tubes and freezing solutions. The point to be finally made is that in the above experiment, "the peculiar aptitude possessed by a part innervated solely by the afferent receptor fibres of a muscular nerve, is the appreciation of all stimuli which produce deformation of structure."

50. Some time after such an operation, protopathic sensibility is present, or the sensibility appearing in the first stages of a lesion. In this condition, pain is distinctly felt, but "any thermal sensation produced by an adequate stimulus to a protopathic area tends to be widely diffused and to be referred into remote parts. In the attempt to estimate the relative intensity of two stimuli, a less cold object covering a larger area of the skin may evoke a more vivid sensation than one of smaller size but of lower temperature." In this stage, also, the hair is insensitive to all stimulation. (As long after the operation as 86 days.) The hairs do not respond with the characteristic "touch" sensation, but bring about a tingling and diffused one, which "tends to be referred to parts remote from the point stimulated. Moreover, the re-

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turn of this form of sensibility (protopathic) does not bring to the skin after shaving any power of reacting to stimulation with cotton wool."

51. In the later stages of a lesion, epicritic sensibility is manifest. Tactual sensations abound in almost the normal amount; localization is good, as are pointedness and relative sizes; and while thermal sensitivity is acute, the compass points are responded to with much irregularity. The touch of cotton wool on a shaven area is clearly appreciated, and the hair clad parts react both to pulls and pushes. The irregularity of the compass tests, however, does not include the item of eccentric reference, and Head believes that spacial discrimination is primarily a function of the epicritic sensibility.

52. The pilomotor reflex, commonly known as "goose-skin," is principally a function of the protopathic sensibility. "The exact date of the return of this reflex was not noted; but we gradually became aware that pricking the skin, pulling the hairs, or the application of the cold tube would occasionally give rise to a condition of "goose-skin" within the area we were testing.

"As protopathic sensibility increased, this reflex could be evoked more easily from the

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affected area than from the normal skin. . . . Even brushing the hairs with cotton wool in this stage of recovery would start a pilomotor reflex.

“With the gradual return of epicritic sensibility to the forearm, this increased response died away . . .

“Whilst engaged on these experiments, we discovered that the ‘thrill’ called forth by aesthetic pleasure is accompanied by erection of the hairs . . . He [the subject] could evoke the reflex by reading aloud some favorite poem.” (Head, *op. cit.*)

53. As to the differences between these systems of cutaneous sensibility in adapting to warm and cold, it is reported that,

“Over normal parts, the neutral point of thermal sensibility shifts according as the hand is adapted to heat or to cold.

“Over protopathic parts, no such change occurs . . .

“It follows that some innervation other than protopathic must exist in the normal skin . . . and that this mechanism is capable of adaptation within a wide range.

“. . . protopathic parts are incapable of adaptation to any material extent,” but “parts in a condition of defective sensibility” are “ren-

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dered apparently more sensitive to the specific stimulus of cold." (op. cit.)

54. "Accurate tactile localization is possible even when the part is supplied with deep sensibility only, provided the pressure is sufficient to stimulate the deep afferent system.

". . . the recognition of two compass points applied simultaneously to the skin, is impossible in the absence of epicritic sensibility, except at distances enormously in excess of the normal.

"The existence of epicritic impulses inhibits the tendency to refer into remote parts.

"Localization is in all probability the sum of two sets of sensations, one of which arises from deep, the other from cutaneous stimulation."

55. The attribute of intensity is found to have the following bearings upon the case:

"Parts in a condition of protopathic sensibility respond more vividly than the normal skin to all stimuli capable of evoking a sensation." [I should rather say "content."]

"This . . . is usually more intense and always of much greater extent than over normal parts.

"For all effective stimuli, the threshold is

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high in a protopathic area, and . . . is one of defective sensibility.

“An effective protopathic stimulus of low intensity, but covering a larger area, may produce a sensation of greater apparent intensity than a more restricted stimulation of greater strength.

“The usual psychological view that an increased sensory reaction corresponds to a lowered threshold must be readjusted. It is true in the strict sense only of epicritic and deep sensibility.” (The italics in the above are mine.)

56. As to punctuate sensibility, Head further reports:

“The skin is supplied by two anatomically distinct systems which . . . regenerate at different periods after complete nerve division. Moreover, a part of the skin may be supplied by one of these systems only.

“Protopathic sensibility depends upon specific end-organs gathered together within the skin to form sensory spots; the spaces between are insensitive to cutaneous stimuli, if the part is endowed with protopathic sensibility only.

“Owing to the sparseness of the heat spots, their characteristics can be easily demonstrated; cold spots are more numerous and correspond-

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ingly difficult to investigate. The pain spots are so closely distributed throughout the skin that it is impossible to study them with the [same] accuracy [as in the case] of the heat and cold spots; but the character of their response, and the period at which they regenerate, show that they belong to the same order.

“Whenever the skin is supplied with protopathic end organs only, any sensation evoked radiates widely and tends to be referred to remote parts. These are the same, whichever kind of spot be stimulated, so long as it lies within the same area of the skin.

“Radiation and reference are abolished as soon as the part becomes sensitive to cutaneous tactile stimuli and to intermediate degrees of temperature.

“All protopathic sense organs have a high threshold. All epicritic organs have a low threshold. . . . When the normal skin is stimulated, the defects of protopathic sensibility are corrected and compensated by the simultaneous activity of the low-threshold epicritic system. . . . The epicritic mechanism is highly adaptable. The threshold for painful sensations is the same over normal and over highly protopathic parts, but on the normal skin the approach of pain is preceded by the sensation of

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contact with a pointed object. This is absent over protopathic parts. The power of recognizing the pointed nature of the stimulating object . . . belongs to that group of sensations by which we estimate relative size."

57. It can thus be seen that "touch" instead of being one sense, as handed down in popular mythology, is more exactly ten or eleven senses, shared among three sets of nerve fibres. For example, we can "physically" *touch* the skin with wool, sandpaper, pin points and heads, or with wooden skewers that deeply deform it,—all touchings, if you will, and yet the conscious content is qualitatively different each time. Quantitative equality in these cases is something that does not exist for psychology,—the intensity is in each case prime; and these quantitative series in psychology possess severally but one term, the term of specific qualitative intensity. However, in their relations to other series, an other than the prime relation exists in those series constituting the separate dermal sensations. The case of paradox-cold is one to which too great emphasis cannot be drawn, for it means that some of the series making up sensation intersect, just as two lines intersect. To be able to arouse a cold sensation with the use of a hot rod means precisely that as much of the cold

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sensation as is thus aroused is identical with the as yet unnamed complex of heat-touch-nerve-touch-organ, called by virtue of surprise, the paradox-cold sensation. It is something more than this; for in these two above-named complexes, there exists a *common part*. Furthermore, this concept of the common part is exhibited in the case of arousing tickle with cotton wool *and* with a fine bristle attached to the tine of a tuning fork vibrating against the skin. The eccentric reference of sensation by the protopathic system to which Head refers is also but a case of common parts in the two series of stimulus-organ-response complexes. It also means for the student of physiology that the response was inhibited along one, its accustomed, final common path, and found its way out by another less blocked.

58. It is almost needless to say, that the prohibition we declared against the use of popular terminology in the first chapter is more than justified by this rather exhaustive account of the nature of touchings and other dealings with the skin. *Impacts*, which have been the glory of physics to reduce to formulae, have almost no meaning in psychology. For impacts branch and flower at the gateway of the nervous system in such a surprising manner, that a new con-

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ception of their significance must react even on the study of physics. For physics should be that area of study in which sensations are exhaustively analysed. Again, in the temperature senses, what we call warmth, heat and cold, are all within a very small range of the possible and actual temperatures. The series is short in psychology, bordered by the series of numbnesses below the lower threshold of cold, and by burnings above the upper threshold for heat. Ice is way beyond our limit of cold imaginations, and the fusion point of even lead bankrupts our sense-imagery. But, having lived so long under the dominion of hyperbole and exclamation points, we flatter ourselves that the range of the imagination is unlimited. We forget that we substitute sensation thresholds for what lies beyond, and thus in the dust of the wheel utter many statements whose meaning corresponds exactly to that of flapdoodle and galoozalum.

59. Nevertheless here is a point where something other than sensational consciousness enters in. The thermometer, by which we measure temperatures accurately, and transcend our sensible appreciation of cold and heat, is in fact just a *detachable organ*, whose business is temperature affectiveness, but whose

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efferent (sensory) nerve is not in the skin, but in the *eye*. That is, we do not *sense* trans-sensational thermometric temperatures, but *perceive* them. And at this point we shall leave the attribute-thing complex called sensation and go to the part-whole complex called perception, at least, as far as dermal sensitivity allows us.

60. When a single compass point is placed on the skin, and we merely react with "there," indicating that a touch of some kind was received, it is called sensation. When, again, the two compass points are placed on the skin, and we, with eyes closed as before, say "there," we have again merely sensational content. But if we are asked to tell whether in the second case there are two points rather than one touching us, and the twoness is manifest, we are on the road to perception. Especially is this true if we notice, by instruction, whether the points are placed in a certain dermatographic relation to each other. Then, if we so locate them, or, if we discriminate the single point as having position relative to a certain other point or a part of the hand, we are *perceiving* along with our sensing,—they both getting simultaneously into the language reaction (common part). This is perception: sensations having structure,

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sensations organized into some relationships and mentioned by the use of nothing necessarily more than prepositions and conjunctions. Drag a point along the skin, likewise, and if the report includes terms in relation, the consciousness is perceptual. Bear in mind, also, that these relations are not "material." Now the perception of cold or heat beyond the thresholds of these senses is vicariously accomplished by the observation of another set of changes than those of temperature proceeding side by side with the sensational alterations. Before the threshold of cold or heat is passed, several sets of changes are simultaneously present, one in the modality specified above, and the other in another modality, say that of sight. The first modality may be in focal, the second in co-consciousness. Then, when the threshold of the first modality is passed, the second modality comes into focality, and functions for both of them without apparent loss to fused consciousness of the modality which has actually ceased to be present. For in such a case, our own responses keep marking time while the physical changes keep mounting their series,—the result being that the very condition of duration in one sense field coupled with alterations in another produces

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the *fusion* or *summation* effect of the sense imagery adequate to the vicarious functioning of the trans-liminal series.

61. Thus perception is, so far, not a "mental act" by which we grasp the data obvious to us. It is, so far as dermal things are concerned, based entirely upon *local sign*, *duration*, *extensivity*, *intensity*, *fusion*, *contrast* and *after-image*. For by the use of these alone, plus the responses of the neural organisation to relations, perception is made clear and unmysterious. And if one asks here, as is inevitable, "how do we respond to relations?" the answer is that all neural functioning is, *ipso facto*, a series of effects and as such is a set of terms in relation. And these relations correspond with the relations between the objects they function. Furthermore, two compass points are, when not fused in touch, psychologically present as (1) "there," (2) "there," and (3) "something relating the two theres" as content. It is likewise with all other relations and terms. Furthermore, when the content is loosely knit, they stand more clearly manifest the longer it endures; while when the content is welded and blent together, it has to be of longer duration to allow the relations to be perceived, and even then the various familiar parts must be allied

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and compared with other things. This also is the door-step to logical-mindedness, as a little reflection will show.

62. It remains to speak somewhat in detail of certain attributes of dermal sensation. Of qualities there are only a few as compared with auditory and visual contents. In touch, there are light touch, superficial touch, granular touch, and the contents characteristic of moving objects on the skin. Intensity has been sufficiently treated in the quotations from Head. The latent period of touch is relatively long, varying from $1/6$ to $1/4$ sec., depending somewhat upon the rate of impact employed. The threshold of touch is determined by the amount of pressure required to arouse the organs, and varies somewhat for different spots. The duration of the touch sensation is connected with the matter of after-image, exhaustion, adaptation, and one or two other attributes, as follows. If the impact is forcible, say a dab with a pencil eraser on the forehead, suddenly withdrawn, there is very little longer duration to the main sensation than to the maintenance of the stimulus. But immediately afterwards, rings of throbbing or resurgence will arise from the smitten area as a center and pass off centrifugally. These are after-images, and may ex-

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ceed five in number as well as exceed the intensity of the original impact as felt. They will be also more *extensive* than the original "sensation." Again, subliminal pressures will sum up into an effective stimulation, whose quality is often itchy or even painful and diffuse. Furthermore, the persistent stimulation of a live touch spot by supra-liminal pressures may exhaust it, so that not even by looking at it and suggesting to oneself that it "ought" to feel touched, can we reaffirm the content above the threshold. Nevertheless, in the case of adaptation, the relating of the subconscious or co-conscious elements of the sensation with other focal contents will suffice to reinstate it among the series of appreciable intensities. Fusions in touch we have already illustrated by reference to the compass points; curious simultaneous and successive contrasts are often obtained by the use of compass points along with an instrument giving single touches. Even when the compass points are beyond or within the two-point threshold, they may be felt as one or two as contrasted with single touches. Clearness is well illustrated in the above case as well as in that of diffuseness and pointedness being present at the same time; while lightly brushing a hair-clad surface will show that "intensity" (as

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an impact phenomenon) is not required for focal vividness. Feeling-tones in touch are beautifully illustrated with the aid of various textures, though touch blends operate here rather than single sensations.

63. As a last word on touch, I wish to cite an experiment upon the difference between the relative percentages of after-images derived from various modes of stimulating the skin, as reported in the "Psychological Monograph" for September, 1912, by M. H. S. Hayes in a thesis on "Cutaneous After-Sensations." The quotation I shall make will also serve to show the nature of the after-image series for dermal sensitivity. The general percentage of after-sensations, both those outlasting the application of the stimulus, and those reappearing after a subconscious interval is as follows:

	"Areal Cold	94.8%
	Punctiform Pain	93.5%
	Areal Heat	89.3%
N. B.	Areal Pressure	88.4%
	Punctiform Cold	84.7%
N. B.	Punctiform Pressure	79.3%
	Punctiform Heat	79.3%
	Radiant Heat	74.5%
	Radiant Cold	67.9%
	Electric Cold	59.3%

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Electric Heat58.3%”

As to latent intervals, they are found most frequently with pressure, and less and less so with pain, heat and cold. Punctiform stimuli function them better than areal; whereas the briefer latent intervals are connected with heat, while longer ones are evident in touch and cold. The author concludes the article by saying, furthermore, that “cutaneous after-sensations are real phenomena, and not explainable by imagination, oscillating attention, or the presence of skin and muscle [?] sensations ordinarily passing unnoticed.”

64. In connection with heat and cold, or better, warmth and cold,—for heat is a curious blend of cold and warmth, with slight admixtures of pain at times,—one needs to notice that the range of temperatures which the skin rightly appreciates is very limited. We shall speak of this range as those temperatures functionally effective for focal consciousness. But just as “physically” there is only “colder” and “warmer,” rather than true “cold” and “warm” or “hot,”—thus offering no objection to the notion that temperature series in psychology overlap and possess common parts,—so in psychology, the sensational value of a thermal stimulus is dependent upon its temperature relative to

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that of the human body. Notice this, furthermore,—that we say we feel *comfortable*, that is, neither warm nor cold, when we mean that there are no noticeable thermal sensations, while yet the temperatures of mouth, nose, and ear, for example, are quite a few degrees different from each other. To this contrast condition, there is only unconscious response. As a “warm” background for sensations, the skin behaves curiously: for we feel a cold stimulus as cold, even while the temperature of the skin affected is rising,—something the physicist would scarcely expect. Other curious phenomena of temperature are the paradox-cold and paradox-heat sensations, while even tapping a temperature spot sometimes arouses the temperature sensation. A similar curiosity is discovered in touch, where the diffuse sensation of light wool can be inhibited by touching with a pencil point the center of the responding area. But all these phenomena, and many others of a like character, merely show that the dermal senses are to be best thought of schematically, but schematically only as comparable to a network of intersecting lines and planes, which cannot, however, be reduced to the ordinary tri-dimensionality of Euclidian space.

65. Pain is not the same as unpleasantness,

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for aches and pains can at times possess a curious agreeability. Pain and pleasure, which common sense makes antithetical, have no such opposition in psychology: for pain is a sensation, while pleasure is an attribute of any sensation. It is to be noted, in regard to pain, that it has an unusually long latent-period. The child whose cries do not come immediately after its being hurt, can thus be whisked out of the pain series if another class of sensations be properly presented to it. Extremes of temperature are called painful, but *they* do not become pains any more than a red becomes yellow; the common part of both series is the basis for this apparent change in the conscious content. Furthermore, pain-producing spots, though the most numerous of dermal organs, normally function less often than do the others, as result of both long latent-periods and habits of avoiding the adequate stimulus for this sensation.

66. If tickle can be aroused by stimulating a hair-clad surface with wool or by drawing a pencil lightly across it, this sensory content is a blend of subliminal touches. Tickle can also be aroused on hairless surfaces, where touch organs thickly abound, and in some cases seems to be interpenetrated with slight, unpleasant

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pain. Other touch blends will be taken up under Kinaesthetic Sensations. The point I wish to keep in mind here is that if a rapidly vibrating bristle *and* other things will arouse tickle, psychologically a spacial *numerousness* over a large area is the same as a temporal numerousness over a smaller one. For psychology, then, numerousness or *periodicity* is a prior category to space or time. And numerousness is a property of the cardinal number system, and not a "mental" or "physical" object.

Questions on the Dermal Senses.

1. Describe fully both the physical and psychological events in producing some form of touch sensation. Make a list of the attributes exhibited and relate them one at a time, as accurately as you can, to the physical stimulus operating.

2. Slowly immerse the hand in cold water, and notice that the more surface that becomes stimulated by the liquid, the colder the consciousness becomes. Do the same with hot water and mark the corresponding effect. Then completely cover the hand with dry sand; or better, slowly immerse it in mercury and notice carefully that something else happens than in the case of the other two liquids. Enumerate all the attributes of sensation involved in the

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three parts of this experiment, and state psychologically the different effects obtained.

Kinaesthetic Sensations.

67. We have seen that a point moving over the skin can be sensorially appreciated. This phenomenon includes, however, the items of intermittence and resistance, which are also present when we move the skin over a fixed stimulus; and these two situations are identical in their cutaneous effects. Now, movement is not a function of the touch organs, and neither is it dependent upon the muscular condition, for there are no muscular sensations, heavy and deep pressures being functioned by the cutaneous system of deep sensibility, and by organs located in the joints and tendons.

68. The quality known as strain which we find as content in pushing, pulling, long standing and the like is derived from an environment upon which the *tendinous* sense is contrasted. The spindles of Golgi furnish the specific organs for this response. It will be noted here, also, that strains as sensations are identical with strains in physics. Content and function here coincide. The strain sensation has common parts with certain members of the pain and warmth series in overexercise, while in buoyant health the "springy" step we experience is due

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to the presence of the attributes of clearness and vividness, quite independent of the threshold. Strain has an obviously precise local sign in some cases, while in others eccentric reference allies it to the protopathic system in touch.

69. Joint sensations have much the same quality as certain touches, especially the deeper ones. To the functions of the end-organs of articular cartilages are due these joint or *articular* sensations. If, before we push a heavy object, we "set" the joint, the subsequent sensations are largely tendinous. Now the statements in regard to movement are almost never indicative of sensations, but rather of perceptions. To report that a limb has moved,—just moved,—is of course a sense report, but to say that its relation to the rest of the body or to another limb is altered, is no longer a matter of sensation, but of perception. This can be built up out of after-images of former position, united with the present sensory datum, or can be directly related,—but in either case, we more properly speak of perceptions of movement, since the situation contains parts, rather than bare attributes.

70. When one feels a rough or smooth surface, not only is touch present, but a certain amount of intermittence and resistance also.

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The reason we do not ordinarily call these contents perceptions, is because, if the eyes are closed, we are uncertain as to the physical nature of the stimulus, and the loose organization of parts is scarcely sufficient to avoid misnaming the stimulus. So we call them touch-blends instead. They are, more exactly, cases of intersensational fusion and summation, and as such have many common parts with each other as we shall presently see. For with all movements, or with all situations in which the tendinous and articular senses are involved, insufficient orientation with the rest of the conscious cross-section produces a condition, the type of which the following illustration will render clear. In the first place, we never know our nerves, and never have any focal consciousness of the release of energy into the effector organs. It is impossible to think of the movements we go through in terms of specific excitation of the moving member,—arm, leg, eye, tongue, etc. We know only late in the game that they have moved beyond the place that is in focal consciousness. Former theorists on the nature of the will have turned over in their graves several times since this was made evident, but it has so far done little good. Active and passive movements alike are unaccom-

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panied by this experience of energy in the consciousness they produce. Furthermore, foot-rules are not part of the furniture of the nervous system; and our blind estimation of how far, or how much further we have moved a member this time in comparison to the last is very inaccurate. It takes a whole orgy of sensations to make a satisfactory perception of movement, and even then the part-whole complex they construct is often top-heavy with eccentric reference of one of the elements. For with all the senses active,—movement, sight, hearing, touch, and the like,—one expects that his body will become an efficient geometer. But in psychology, there are no unequivocal calibrations. The quadrants, sextants, slide-rules, meter sticks, and so forth, which we make and use, are again adjustable touch, movement, and sight organs, derived from countless comparisons with and contradictions of data obtained by the naive sense organs, as well as made under conditions in which the natural forces themselves inscribe their periodicities upon receiving surfaces. In comparison to the accuracy of these records, almost all naive perceptions might be termed blends, for as true perceptions they are seriously unstable.

71. I shall quote E. B. Titchener's account

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of touch blends, as found on pages 171-2 of his "A Text Book of Psychology," since it seems both thorough and quite in line with the view of sensation as propounded in this book. "The difference between hard and soft, for instance, is mainly a difference in degree of resistance offered to the hand; and this means a difference in the degree of pressure exerted by the one articular surface upon the other. The distinction thus belongs to the joints rather than to the skin. Again, the difference between smooth and rough is a difference, first, between continuous and interrupted movement, and secondly between uniform and variable stimulation of the pressure spots of the skin. The distinction thus belongs to joints and skin together."

"Sharp and blunt differ, primarily, as pain and pressure: a thing is sharp if it pricks or cuts, blunt if it sets up diffuse pressure sensations." . . . "Wetness is a complex of pressure and temperature. It is possible, under experimental conditions, to evoke . . . wetness from perfectly dry things,—flour, lycopodium powder, cotton wool, discs of metal; and it is possible, on the other hand, to wet the skin with water and to evoke the perception [?] of a dry pressure or a dry temperature. Not

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the moistening of the skin, but the fitting distribution of pressure and temperature sensations, gives rise to the perception [?] of wetness. Other modes of distribution of the same sensations produce the perception [?] of dryness.

“Clamminess is a mixture of soft and cold: the cold sensations and the pressure elements in the softness must be so distributed as to give the perception [?] of moisture. The clammy feel of a wet cloth may be got by laying the finger on a loosely stretched rubber membrane, and sending a puff of cold air over it at the moment of contact. Oiliness is probably due to a certain combination of smoothness and resistance; movement seems to be necessary to its perception [?]. Clinging, sticky feels may be obtained from dry cotton wool.”

If, then, an identical conscious content can be provoked by two or more differing mechanical means, we can but say that they have common parts: they coincide in the effects they produce. We have noticed this item in connection with the phenomenon of a “touch” becoming “painful,” and have dealt with the error involved in such a statement. Further illustrations of the same thing will occur profusely in, for example, the sense of sight, but we only need

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prophesy here that no "red" ever became a "yellow," as will turn out after the whole bandage has been removed.

Taste and Smell.

72. These two senses are very intimately connected in the conscious cross-section by virtue of the fact that they blend together so inveterately. But psychological analysis separates them with ease, and their definite connection with chemicals is quite complete. The taste organs are taste buds, which are calyx-like structures in the papillae of the tongue, parts of the soft palate, the larynx, and a few other places. There are taste buds also in children on the inside of the cheeks, and in the center of the tongue, which, in adults lacks responsiveness to taste. There are but four primary qualities of taste,—sweet, salt, bitter, and sour,—all others being smell-taste mixtures, or compensations and rivalries either in one sense or the other, or between them both. Oscillations are also frequent between tastes of a high intensity. In general, the adequate stimulus is a *solution*, which is part of the function of the salivary reflex. Besides, chemical salts taste salty, sugars taste sweet, alkaloids bitter, and the acids sour. However, there are some chemical salts that taste sweet, others bitter, while quite a few are

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tasteless. Too, some few acids taste sweet, some are tasteless, while one, hydrocyanic acid, gives bitter. Very salty solutions slightly burn, and very sour things become astringent or painful. Likewise, sweets in saturated solutions prickle or burn the tongue, while bitters often have a fatty as well as a burning quality. Only solutions taste, whether the solvent be solid, liquid or gaseous, but just as there are salts which do not taste salty, so there are some solutions which are tasteless.

73. Taste is easily localizable, being unequivocally in that complex of solution-tongue. But in taste, one must carefully distinguish between the *quality* of the taste and the *quality* or *intensity* of the solution as well as other things. An apple, let us say, tastes either sweet or sour; but as something eaten, as something in the mouth, there is much more to be considered than the bare taste quality. There are, for instance, the elements of pressure, movement, and duration, any or all of which give us the characteristic perception of eating this or that thing. It is known that a jaded palate is more often appeased by alterations in duration and pressure concerned in "reducing the contrary material to submission" than by alterations of the specific taste ele-

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ments themselves. The most interesting attributes of taste are fusion, adaptation, inhibition, and contrast, especially as they occur in cooking. Lemonade is both sour and sweet, and also a partial fusion of these two qualities. Sweets taste "smooth" and acids "rough," and thus lemonade is a complex of five, if not of six separable things. We sweeten bitter coffee and tea,—nature not having consulted with us in planning the woodside order of these beverages. Salads are another case of the "search for happiness" (?), in which concoctions sugar offsets the salt, while both either inhibit or enhance the oil and vinegar to a slight degree. A strong sweet and a salt make an insipid combination, but neutralize each other into a vapid blend, if weak. And so on. The contrast effects of tastes may be either simultaneous or successive, and subliminal sweets often sum up into something focal, which, if based on bare quantity, plots an unexpected series of relations between the two thresholds thus obtained. The latent period of taste, from long to short, runs as follows: bitter, sour, sweet, and salt. But in taste mixtures, this order does not follow the combinations made on a quantitative basis. For while the neutralizations (inhibition) are best in the order: sweet-bitter, sour-salt, salt-

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bitter, sweet-sour,—following slightly the laws of color mixture,—yet new series are developed in the mixing which have their bases in something other than chemistry or physics. Even the time relations of tastes would suffice to develop “newness” in the gustatory cross-section. Contrast in taste is more marked than adaptation, and adaptation to one sort of solution always leaves the other three intact. Liminal sour on one side of the tongue applied at the same time as a subliminal sweet on the other, may bring the latter to some sort of focality; while subliminal bitter, when applied with another taste, is usually present as sweet, if at all.

74. Taste is a difficult sense to study, as one can easily imagine. The mouth must be bulwarked with cotton, and the tongue wiped dry incessantly, while the experimenter, with a fine camel's hair brush stimulates the various papillae. But by dint of patience, the following general facts are well established: the back of the tongue senses bitter, the edges sour, the tip sweet, while salt is sensed by nearly every part of it. Some of the individual taste buds respond to all stimuli, while others to but one or two; continued touching of the papillae also exhausts their functioning power. The threshold, as might be expected, varies with the amount

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of the liquid taken, but for equal quantities of solution, a 0.2% solution of sulphuric acid, a 0.4% solution of salt and a 1.2% solution of sugar is sufficient to effect a focality of taste. Curiously enough, also the electric current tastes,—doubtless due to ionization,—while with the ears full of warm water in which electrodes are bathed, a sour taste in the mouth results. However, inasmuch as the nerve supply of the tongue is functioned by the vagus, lingual and chorda tympani, such a phenomenon is not altogether anomalous.

75. The curious common parts in the dermal senses have already been intimated. Chemically, there is apparent evidence for allying the various tastes more effectively than there is physically for allying the senses of warmth and cold. The so-called III, IV, and V groups of chemical series are generally sweet-tasting, while the “inorganic, bitter-tasting substances are derived from positive ionization of the I and II groups, and from the negative elements of the VI and VII groups.” On this basis the sweet-generating molecule is also potentially a generator of bitter. But much clean experimentation is yet to be done upon this sense field.

76. Smell, like taste, is a chemical sense,

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but smell is peculiarly a land and ground sense, used by man only for its nutritive and protective value, and not for such purposes as are employed by those animals in whom it is best developed. We find our food by appointment and not by odor. The organ for this sense is not the total nose, but is a very small, brown patch of mucous membrane high up in the whorls of the anterior part of the head cavity, ciliated and bathed in liquid. The cilia waft forward, also, thus driving those odors ordinarily unnoticed in eating, which rise through the posterior nares, out toward the forward apertures, and in this way function a sort of extra sentry-duty upon our food. The cells in this patch of mucous are similar to the taste cells, and the olfactory nerve, which supplies them, is the shortest in the body. Part of the region concerned is also supplied by the trigeminous nerve, and there is unusual sensitivity to cold, heat and pain in that area of the body. It is thus doubtful whether one should call the organ of smell and its environs inside or on the surface of the skin.

77. Contact is essential for smell, and either vapors or particles can stimulate. The local sign of an object of smell is given by virtue of its position in the cone-shaped area defined by

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the apertures of the nose downwards. In general, those substances which whirl while dissolving in a liquid can be smelled, but not quite all whirling substances are odorous, nor do all smellable things whirl in solution. Again, some substances must be applied in solution to the brown patch directly, in order to be sensed by this organ. Furthermore, the brown patch is not on the main line of conduction from the front to the back of the nasal passage, but the odors drift and are wafted thither by the cilia instead. In spite of this fact, the threshold is very low, being given as one millionth of a milligram of mercapton dissolved in a cubic decimeter of washed air. There has been some attempt to relate the chemistry of smell to the psychology of it, but no one has plotted the series very far or very assuredly, since smell is even a more difficult thing to test than taste on account of sudden exhaustion and adaptation.

78. While there are but four original tastes, there are several hundred smells, sometimes arranged in classes, but without well determined bounds. Aromatic odors certainly differ from the vapors of dried fish, but in psychology, there is frequently as much "difference" between the near together as between the far apart. This may be politely analogous to the status of rela-

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tives and strangers. Some smells also taste sweet, others bitter, while some are instantly painful withal. Some arouse tingling, some tears, and not a few nauseate. The inessential attributes of smell largely constitute the sensation, since adaptations, fusions and inhibitions are especially frequent and potent. The curve of qualitative intensity falls with exceeding rapidity during the first few seconds, as every boudoir enthusiast knows. But smell mixtures are possible in smell in a way not quite known in taste. There are two brown patches, one in each nose, and the nasal passages do not unite that far forward in the head; thus one smell can be led to one nostril and another to the other, so that there can be an effect produced for consciousness not referable to the single, separable organs alone. The "position" of smells, therefore, is not necessarily in the space of our forefathers. Smells will also mix in the same nostril, just as tastes on neighboring papillae. But smell mixtures are less stable than color mixtures, and there is also no clear cut antagonism in this field as there is in sight. Smell is lacking in the negative after-images we find in the temperature senses and in taste, a phenomenon that allies it likewise with the domain of sound. Peculiarly special in this sense

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field also is the case of the elevation of the threshold for discrimination after partial adaptation, thus making contrast here a derivative of one of the temporal attributes of neural release.

Hearing.

79. In connection with this modality, it will be requisite that the student have access both to enlarged models of the ear and to charts showing the various dimensions in outline, for a verbal account of so intricate an organ is usually misleading and often fails to flatter the descriptive powers of an author. We shall speak, then, of the functions of the various parts, presuming some slight anatomical knowledge of the terms employed. Every one of the attributes of sensation is clearly illustrated in connection with audition, and the importance of this sense field being so obvious, it will be advantageous to keep in mind the schematization of sensation given in the introductory paragraphs of this chapter, as well as to note carefully the differences between the aural functions and content, and those of the previously discussed sensory fields.

80. To begin with, there are three main groups of auditory qualities: tones, noises and voices. The adequate stimulus for audition is air or other vibrations which reach the ear.

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Sound is not all due to air vibrations, for the sound of a tuning fork placed on the crown of the head or on the teeth will be conducted to the receptive surface by means of bony bridges; but vibrations of some sort must set the apparatus in motion for there to be a functioning in sound. It must be observed that an air or bone vibration is not a blank flutter. Cases of vibration are cases also of the *frequency* of the impacts, the *amplitude* of the wave motion and the *form* or regularity of the disturbance of the particles of the transferring medium. Each of these has an important finger in the auditory pie. For while the number of the vibrations means pitch, high or low, while the amplitude of the vibrations means loudness, and while wave form is a specifically differentiating element in tones, noises and timbres; yet all high tones are intrinsically loud, and low tones intrinsically weak. Also, by a figure, we call the former bright or thin and the latter dull and broad by virtue of the fact that we habitually see the means of their production. Again, while the wave form is what we mean physically when we speak of clarionets and French horns, we also have the expression "tone color," by which is meant the pitch, "size" and intensity of a certain given tone. Within these three groups,—

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tones, noises and voices,—there are exceedingly many separate qualities, clear from the lower limit of audibility (pitch) to the highest tone which can become focal in consciousness. These two extremes are called, respectively, the lower and upper thresholds of pitch. The audible range extends from about 12 to 40,000 vibrations per second, but the recognized musical scale is between 40 and 8,000 vibrations only. The letter “s,” which occurs so frequently in language, is almost at the upper limit of hearing, as can be made manifest by comparison with notes on a Galton whistle. There is also another very important threshold in sound, and that is the duration threshold. Any note, to be heard distinctly in its physical pitch, must be represented by at least two vibrations before it has value in the diatonic scale. Otherwise it will not set into operation the mechanism of the ear sufficiently to arouse a tone sensation rather than one of noise. For noises are crowds of still-born tones.

81. The function of hearing is partly accomplished by a mechanical apparatus of the following kind. The outer ear, or concha and external meatus, are together a funnel for receiving sound. They together form an unobstructed opening into the head, the external

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meatus ending at the tympanum, or drum. This drum is a tough membrane of fibres radiating from the center, and performs an adaptive function as well as its function in hearing. It is likewise protective, especially in its collaboration with the action of the Eustachian tube, for we prevent rupture of the ear drum by keeping our mouth open in the presence of sharp explosions, thus equalizing the pressure of the air on both sides of the drum. By means of attaching a very small convex mirror to the tympanum and observing the play of reflected beams of light cast on the surface of the mirror, observers have been able to detect with sureness just what part the tympanum plays in the hearing of certain sounds. The tensor tympani,—a small muscle attached to the hammer bone, which acts torsionally upon the tympanum,—is observed to contract with the increasing intensity of the tone. This function does not operate in connection with pitch, except insofar as the highest tones are intrinsically intense, as noted above. At a sharp sound there is instant contraction of the membrane, barring of course the latency required for such adjustment. After the drum is “set” for a certain intensity, it vibrates as a whole sympathetically to the number of vibrations in the generating

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body, and even vibrates in partials when the overtones of the stimulus note are relatively strong. We speak here particularly of notes in the middle register of the musical scale. Not only does the drum vibrate *pro tanto* with the stimulus, but the small bones in the ear do likewise; for clear to the oval window the separate vibrations can be traced along the bony chain, which has been especially studied in the vibrations of the stapes when the tympanum is entirely absent. The general function of the organs of the middle ear is to vibrate freely as a whole to moderately low and mildly intense sounds. But the higher in pitch and the greater in intensity the sounds become, the tighter become all the loose parts in the external and middle ears. Thus the function of hearing some things is partly accomplished without reference to anything but a mechanical apparatus, insofar as the transfer of sound vibrations halfway into the organ is concerned. Nevertheless, the one-to-one correlation above indicated is but brief in the series of sounds, and the disorganization of our expectancy begins even at the tympanum. For here vibrations of a relatively great amplitude and slight strength are turned into ones of smaller amplitude and greater strength. Furthermore, the tympanum,

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when stretched, becomes a functioner of entire energy rather than pitch, for the amplitude of its vibrations in this case is very much decreased; while if the tensor tympani is cut, the vibrations of the hammer head are considerably increased. These two additional items must also be noted: first, that if a sound is led to but one ear, the other ear functions it by conduction through the bones of the head and the Eustachian tubes, and second, that persons who lack the ossicles, still hear very high and very low tones.

82. Before taking up the interesting mass of material in audition which better concerns the psychologist than most of the discussions about what becomes of the vibrations after they are prodded into the oval window by the foot of the stapes, we had better outline in brief the general nature of neural functions in regard to periodicities in general. For the concept of periodicity includes not only such things as air-vibrations, but also such things as roughness, smoothness and a few other phenomena in the dermal modalities. We saw in connection with the senses hitherto considered, that if one became frightened as to how in the world the qualities of sensation managed to get into consciousness, there was nothing to do but to in-

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voke the general mysteries of nature, or necromantically squeeze the nervous system until something like a reality oozed out. With hearing, as in the other senses, we shall not have any need to waste wonder over how the vibrations get heard: *vibrations do not get heard,—they get counted.* Vibrations are not all there is to tones, noises or voices: the vibrations are the part of these phenomena which are open to the investigations of physics. The part not specifically physical, but specifically psychological—(and call it psychological and nothing else, if the grumbling spirit moves you)—consists of things we call tones or other qualitative auditory phenomena, which, insofar as they are correlated by the physicist, are said to be dependent upon vibrations; but which, as apprehended by the psychologist, are something else than this. Besides, it is not up to the psychologist to tell how he hears, but literally only what he hears. As for the physiologist, he may clip his tensor if he wishes, but if he does, it is no gauntlet thrown down to the physicist or the psychologist: it is his own boomerang. The central fact of psychological data is the principle of order,—what I have elsewhere called series,—and it has been shown that the attributes of sensation are series for the most part of no temporal or

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spacial character. The name in physics for these series or orders is periodicity of vibrations, while the physiological name for them is electro-chemical waves of neural discharge or release. However this does not make the narrow strip of territory between physics and physiology called Psychology a petty and indigent principality doing homage forever to its aggrandizing neighbor kingdoms. For only a few even of the mathematical sciences can claim to be based upon series which have a full quota of members. In physics, in chemistry, in physiology as well as in psychology, there are many series which cannot muster all the terms inferred from their point of origin and their subsequent development. Nevertheless, in this connection the point to be made is that not all things are physical nor chemical, nor yet "mental," but whatever partial orders there are in these and the other sciences, they frequently exhibit the phenomena of the common part. Here it is that many curious things often happen in science on account of the hasty desire of theorists to rigidly apply throughout a science a principle that is exhibited only a little ways in the data they have honestly observed.

83. Thus the only reputable theories of hearing, of sight, of emotion and any other phe-

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nomena are bare enumerations of the facts arranged according to whatever principles of order are manifest. As is the case with other sciences, the data of psychology define their own dimension, and as observed before, necessitate the use of a system of terms in need of no apology in the presence of the other sciences. If, then, one asks how hearing is functioned, the answer is that the orders or series of audible things are partly correlated with physical vibrations, partly with neural periodicities, which are *not vibrations of the nerves* at all, but waves of neural release corresponding to the periodicity of the impacts of the stimulus. The connection is functional; whether there be identity now and then is neither a case for exultation nor alarm. Within the ear, then, we have seen that the organs in the air-filled spaces of it have a definite functional as well as mechanical relation to the sounding stimulus; but in the liquid chambers of that organ, the case has not been altogether facetiously called "a watery correlation between hearing and hammering"; for the action of the basilar membrane with its "harp of a thousand strings" is itself the definer of a new order of relations between stimulus and content. For this membrane, directly an element in the neural tissue, translates the phys-

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ical impacts into neural releases of such a character that the content of consciousness is identical with the qualitative character of the sounding and vibrating stimulus. The sound may be in the head, by virtue of bone or even air and nerve conduction, but it does not originate in the head, nor is it hurled from the brain as a sort of by-product. The sound may be in the head, in the ear,—in fact anywhere you please,—but it is IN whatever is stimulus as well as content of consciousness. For the conscious cross-section includes the knowledges of everything, whether it be the introspection upon our poor relations, or our observations of and including the librations of the moon.

84. To give exactly the relation between tones, noises and vowels (voices), I shall cite the unusually significant and clean experimentation of Jaensch. He placed a selenium cell in the circuit of a telephone which was illuminated by an arc lamp whose light was varied in its continuity and steadiness by the revolutions of an obstructing disc. This disc, moreover, was so cut about its edge that the variations in the length of its radius corresponded with the variations in height of any sound form-curve. By means of this apparatus he demonstrated that (a) a constant rate of vibration produces

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a tone (e. g. mean variation of zero), (b) the same average rate of vibration produces a vowel-like sound if the mean variation from the average is still small, but (c) with the further increase of the mean variation the sound, after passing into the vowel character, passes again out of it, until, with the mean variation being very great, nothing but noise is produced. Thus he showed that the average rates of vibration of the letter sounds, *m*, *u*, *o*, *a*, *e*, *i*, *s* and *ch* are very nearly octaves of each other in an ascending series. But this octave connection is not inclusive of the fact that the vowels are necessarily to be identified with certain tones, even if the prolongation of a vowel at a steady pitch always necessitates its being based upon some note in the musical scale. Thus vowels are something of tones and something of noises, though no octave connection exists between noises. Noises can be produced with striking resemblance to the musical scale, by the dropping of sticks of uneven length upon a flat surface. Orchestra players know very well that the "*attack*" required in *sforzando* passages is an actual noise. The relation between these three sorts of auditory qualities can be further elaborated by saying that with the increase of variation in the number of vibrations per sec-

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ond, there is a corresponding decrease in the definiteness of the pitch. But this scheme is best at about 1000 vibrations per second, for it waxes as one ascends or descends the pitch series, ceasing altogether at both 32 and 32,000 vibrations.

85. The physical analysis of sound waves shows two main patterns of vibration: periodic and non-periodic. A periodic wave is one in which the same movements are repeated, however complex, during equal periods of time, however long. A non-periodic wave is wholly devoid of regularity. The periodic waves are subdivided into two lesser classes, pendular and non-pendular, these terms referring to the simplicity of their form. Thus the pendular waves represent pure tones, such as are produced by bottles and tuning forks, the form of the wave being a sine curve; while the non-pendular represent such tones as are produced on musical instruments, being accompanied by a series of overtones or partials. Voices and noises thus are composed of non-periodic sound waves, differing in their percentage of regular interruptions as indicated previously.

86. Every contained volume of air as well as every more or less regularly (or orderly) shaped physical object, whether solid or hol-

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low, has its own specific rate of vibration, which can be aroused not only by mechanical impacts, but by the surrounding air being thrown into suitable vibration. The vibrations which act thus as a stimulus, however, need not be the same in number as that of the sounding body of air or wood, for example, but must be related to it according to the laws of overtones with whose series it has a common part. We shall illustrate this in the following manner. When the low C string of a Cello is vigorously struck, not only is that particular tone sounding, but a great number of harmonic tones, generated by its automatic division into halves, thirds, fourths, fifths, sixths, etc., in which case the tone of the string may be compared to the base of a veritable pyramid of sound, the harmonics being fainter the higher they are in pitch. They all appear simultaneously, of course, their number and intensity being partly dependent upon the intensity with which the ground-tone is struck, though a few of them are implicit in the fact of their being any ground-tone at all. If the low tone be C, its first overtone, being generated by the string vibrating in halves, will be a note of the same name, but its pitch will be an octave above the generating tone; the second one will be G, one fifth above

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the first, being generated by the string vibrating in thirds, and so, as in the table following:

Tones and Over-tones	Name of Note	Amount of string vibrating to produce it
Ground tone	C	Entire string
First overtone	c	half
Second	g	third
Third	c'	fourth
Fourth	e'	fifth
Fifth	g'	etc.
Sixth	b' flat*	
Seventh	c''	
Eighth	d''	
Ninth	e''	
Tenth	f'' sharp*	
Eleventh	g''	
Twelfth	a' '''	
Thirteenth	b' '' flat*	
Fourteenth	b'' '' natural	
Fifteenth	c	

Now mark well this sign (*) in the above scheme. For where it occurs it means that the notes so designated are all *too flat* to be used in the diatonic scale, even though they were generated out of "pure nature" and represent the natural development of overtones from a low, generating string. Even a Stradivarius or Guarnerius Cello will fail to produce anything more available for music than these, which simply means that the "natural" order of tones as above developed is but one of the tone-orders, coincident at some points with the order of presentable music, but diverging from it at many others. In other words, we use only certain special tones of the "natural" note series in the chromatic scale, discarding those which would clash with some of the harmonic tones generated from certain other ground-tones.

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For when we want an f-sharp that will give keenness to the tonality G,—as the note b-natural does to the tonality C,—we do not select nature's f-sharp as derived from C, (as in the above scheme), but we derive it from a ground-tone D, in which case it will be generated as the fourth overtone of that series. And not only is the whole keyboard scale of the piano made in this careful, searching manner, but even then, the various scales are tempered to each other, so that transitions from one key to another will be possible enharmonically. That is we employ the note midway between G and A, for instance, as either G-sharp or A-flat, depending upon the tonality about to be entered or passed through. This account may briefly suffice to give a hint as to the intricate nature of the series of tones, whether due to pendular or non-pendular vibrations. The point to be made in passing is, that just as the lowest string of the Cello arouses its population of overtones, so will any sounding body tend to throw into vibrations any other body within effective range, whose natural rate of vibration is the same as its fundamental or the same as one of its partials. But we shall meet with a corollary to this law in connection with difference tones.

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85. Strictly psychological is the matter of tonal intensity. Two notes, equally intense, when played together, will not produce a resultant of double the intensity. If one asks whether it is $3/4$, $4/5$, or any other fraction of it, no answer can be given. It is not less, to be sure, nor is it twice as much, but as hinted at before, the intensity series rarely consists of anything but primes. We met with much the same situation in connection with the dermal senses. The eccentric reference of a local-sign as exhibited there is paralleled in one of our responses to notes which are near the lower limit of audible pitch. If the note 30 vibrations be produced on the Ebbinghaus acoustical apparatus, and carefully attended to, it will appear to have a recognizable pitch, and be heard in its proper place in the series. Now let the note of 60 vibrations be sounded, noticed, and followed by the previous lower tone, and the observer will detect that the lower note was formerly heard *too high*, thus indicating that the straight, linear series of tones in physics, became curved at its end to the unaided ear, so that almost any note between 25 and 32 vibrations per second would have appeared of the same pitch. Here then would be a case of unchanging sensory content with changing stimuli,

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a thing not so very different, so far as series are concerned, from the phenomenon of various means producing the tickle sensation, or the sense of pain.

86. We have mentioned so far three thresholds of pitch. There is now a fourth to be considered in connection with the phenomena of fusion, summation, contrast and the like. This is the threshold of pitch difference, and it has been just treated in one of its aspects in the previous paragraph. Pitch differences are determinable both by a simultaneous and a successive presentation of the sources of sound. In physics, they are settled by recourse to graphic and other methods, but in psychology they are referred to the ears, for it is by them alone that we gain criteria for the use of tones in the realm of art. To come closer to the point, a pedantic physicist would hold up his hands in horror at the use of certain tonal and harmonic effects in an orchestral symphony. Nevertheless, the physics of sound does not include the element of the esthetically satisfactory character of the resolution of a dissonance. However, the series of objects which have standing in psychology are just as empirical as those in any other science, as the reader who has followed me is well assured. An orchestra

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or chorus frequently inhibits many a serious tonal error by the dynamic qualities produced by its ensemble.

87. The physicist is acquainted with inhibitions in the action of interference tubes. Another kind of inhibition is found in the phenomenon of beats. Beats are a function of the difference in the vibration rates of tones simultaneously sounding. If we have two sources of sound, one of which vibrates 100 and the other 102 times per second, there will be 2 beats per second. Which is to say that twice each second the two wave systems will coincide and produce a maximum sound (mutual reinforcement), and twice they will be half a wave length apart, and then the sound will all but disappear. Now physically, we might expect there would be as many audible beats of the same character as the numerical difference between the vibration rates of the notes simultaneously sounding to produce them. However, a significant divergence at once appears in the qualitative aspect of the increasing difference between the generating tones. For there are four well-marked qualitative stages in beats, which are a psychological series rather than a physical one, whereby it is again seen that various kinds of quantities and intensities

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may be co-present in any conscious content. Between two notes from one to six or seven vibrations apart, the beats have a well-marked "swell"; when the vibration difference is between eight and twenty, a "sudden rise, pointedness or thrust" is manifest; at a difference of twenty to thirty, a rattling effect is produced; while the roughness that characterizes a difference of about forty vibrations disappears entirely at some fifty vibrations per second between them. What then appears is consonance, rather than dissonance, and we have fusion in the result as opposed to the previous effect. Again, if we keep increasing the distance between the two tones, some roughness constantly appears until another musical interval is reached, and so on, as far up the scale within an octave as we care to go. Thus the musical intervals might be considered in one aspect as *primes* in the beat-series, for no graphical record of them would give a hint as to the places where fusions of consonance pop up as it proceeds. Of psychological interest, again, is the differing qualitative and quantitative character of the fusion value of the various intervals generated by the beat series. This is evidenced by the fact that the musical intervals which in linear series are the unison,

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second, third, fourth, fifth, and so on are not better and better fusions in this order, but in another one entirely,—this again not deducible from the physical aspect of tones. Let me indicate in a table the relations between the two series.

I. Order of appearance of intervals in the beat series: II. Order of fusion of the same intervals:

Minor second	Octave
Major second	Fifth
Minor third	Fourth
Major third	Major third
Fourth	Major sixth
Augmented fourth	Natural Seventh
Fifth	Minor third
Minor sixth	Minor sixth
Augmented fifth	Augmented Fourth
Major sixth	Augmented fifth
Natural seventh	Major seventh
Major seventh	Major second
Octave	Minor second

The second column above is a trifle individual, but even then it represents the matter fairly. The series of fusions thus given appears once more to form quite an independent series, a series which may be exactly termed the second derivative of beats, but which again in a strik-

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ing manner harks back to physics in this way, —that these intervals are the same as those derived from the harmonic notes of the “natural” vibrations of strings. The simpler the ratios of the above intervals, furthermore, the sooner they appear in the natural system of overtones.

88. But yet another set of empirical data is to be presented. Beats produced between two very high notes, say about 1,000 vibrations per second, show only one stage of the above four qualities: they *chirp* rather than rattle or roughen. Again, the two lowest strings of the Cello when sounded together in the seemingly consonant interval of the fifth, produce beats; just as any two low notes, no matter how consonant, (barring the octave and unison), lack the smooth character of the same intervals in the middle register of the scale. Beats can also be produced by two dissonant tones when each is led through a tube to either ear, even when the separate tones are inaudible. This phenomenon is due to the action of the bony apparatus of the middle ear, and is termed “binaural beats”. Substantially the same phenomenon is met with in many other modalities besides sound, but oftener as a fusion-resultant than as a case of inhibition. There is at pres-

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ent some inclination among students of tone to consider pitch as equivalent to local-sign, and to regard the musical intervals in the same way as the fusion of two touches or colds upon the skin surface. Accordingly, if only a few beats per second were present, there would be an intermediate locus for the beat-tone of three or four vibrations per second, but insofar as the musical scale is concerned, *its* "position" would be assimilated by one of the generating notes. Following this, the concept of tones as a linear series would have to include the attribute of bi-dimensionality. Hints as to the probable correctness of this view will appear in the general treatment of the psychological nature of the scale, soon to follow. As a matter of fact, beats are heard as "fluctuations of a single tone, whose pitch is indistinguishable from that of the generators". Upon increasing the difference between them, the number of beats actually functions a tone quality, recognized as an intermediate tone, "which at first lies near the lower generator, and gradually rises in pitch until it approaches the upper", granting the ever-widening distance between the two generators. At the point where the beats become rough, however, the tonality of

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the intermediate tone which carries them is lost, and we hear only its noisy aspect.

89. Another singular datum is the difference-tone. When two notes in the medium or upper register thirty or more vibrations apart are sounding together, there will be heard an entirely new tone, very deep in pitch, of as many vibrations as the arithmetical difference between those of the generators. This might well be called the *undertone*, in distinction to the overtones previously described. Under favorable conditions, also, as many as four or five of these undertones can be produced, whose pitches coincide with the following scheme.

Let u be the vibration rate of the upper generating tone, and l be the vibration rate of the lower, and $D1, D2, D3, D4, D5$ be the symbols for the various undertones, then $D1 = u - l$, $D2 = 2l - u$, $D3 = 3l - 2u$, $D4 = 4l - 3u$, and $D5 = 4u - 5l$, etc.

The final important tonal phenomenon to be mentioned is the interruption tone, which has strong alliances with the item of beats. The number of times a tone is interrupted, as especially evidenced on the siren,—but not the siren that deceived Ulysses,—becomes the vibration rate of a new tone, whose difference from noise is significantly correlated with the periodicity

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of the interruptions. The tone interrupted may also combine with the interruption tone in two ways; either as a summation effect, evidenced by a note of the combined pitches, or by making a difference tone, in the manner illustrated above. In the case of both difference tones and summation tones, it is to be kept in mind that they are often generated within the ear, and localized furthermore within the head, at a point midway between the two tympani. This corresponds to the eccentric reference mentioned in connection with the protopathic system of the touch organs. By the use of resonators, however, some of them can be made the subject matter of physics as well as of psychology.

90. The musical scale presents an important problem in psychology, independent of the mechanical system which produces it. Two tones in unison and two tones an octave apart are more fused than any of the intermediate intervals of the scale. It has been previously shown that both beats and musical intervals are produced by steadily increasing the difference between two generating tones; but what the nature of the scale, as a case of order without exclusive regard for physics is, has not been settled. The intervals of the scale, as fusions,

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are not in the same series as they are in the series of increasing pitch differences, for the interval of the fifth, for example, which is midway in this latter series, occupies the second place in the fusion series, and the second and seventh, as musical intervals, both lie at the upper end of the series of fusions. The other intervals, likewise, are dispersed in the transition from physics to psychology. They are of course, both in the conscious cross-section, inasmuch as we know their separate characteristics, indeed, almost better than we can speak it out. But physical instruments of measurement, in addition to being detachable sense organs, respond usually by means of the efferent nerve of a different sense than the one they were constructed to be an adjunct to. Especially is this so in the case of sound, where the best we can get from physics is a graphical record and not an improved psychological ear. So that when one asks what the scale and the fusion intervals constitute as an organized system for psychology, he must consider all the data investigated, and find his ultimate order in what we are as psychologists often led to call our favorite *interpretations* of the facts. At the same time in strict logic we discover that they are often those principles from which

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all the data originate, whether they be the stuff of physics or of any other realm of investigation. Let us then consider the grounds for regarding the scale as something other than a simple, linear series in but one dimension. The pitch rises, to be sure, and as it does so, the scale ascends to the octave of the original note. Yet in so doing, it ends, from the standpoint of fusion, where it began, or at least nearer to that position than at any other in the physical order. Schematically, then, it loops back to a point on the perpendicular erected upon the starting point, but in the transition, it extends farther from the perpendicular at the interval of the second and seventh, than it does at the fourth and fifth, making also other curious twists and returns before the whole gamut is passed through.

91. It is not my intention to state any solution for this intricate problem, but only to show why it cannot be regarded as a serious one. There are other orders than the rational, other dimensions than those handed down as a legacy from Euclid, and the fusion order of the musical intervals does not perplex any one who understands the havoc time plays with deduction, as already illustrated at every place where opportunity afforded. Some problems are

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solved by sheer brute force, others by the application of analogies, and still others by being dropped. Expectancy is not the cue to the correctness of an answer, and in regard to this question of the "rationality" of the fusion intervals of the scale, it can be readily shown why the order of preferences takes precedence over the order of vibration ratios and their geometrical relations to each other. This is the evidence:

(1) To determine the fusion values of the various intervals, one must ask for preferential judgments from musical subjects.

(2) Likewise, one must ask unmusical subjects whether they hear one or two notes in the interval, and how clearly they hear them: fusion being a case of partial inhibition.

(3) Judgments of the amount of fusion are within the realm of "psychological quantity",—a series, by the way, which is as likely to contain all primes as it is to contain other integers of an ordinal relationship.

(4) While the intervals of the octave, fifth, fourth, third, and the like are correlated with the mathematical ratios of $1/2$, $2/3$, $3/4$, $4/5$, $3/5$, $5/6$, $5/8$, and so on, and while the geometrical ratios between them may be exactly specified, the simplicity of these ratios does not compare with the simplicity of the conscious

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content produced by them. Besides, no constant geometrical ratio exists between the ratios of these intervals, unless they are arranged in a series conflicting with them as a series of preferences. Even then it is poor. $1/2$ is $3/4$ of $2/3$, $2/3$ is $8/9$ of $3/4$, $3/4$ is $15/16$ of $4/5$,—so far very well; but nothing whatever can be done with such ratios except to lay hold of their simplicity as an evidence that fusion has evident mathematical correlates. But this is saying nothing more than that correlative simplicities are found between physics and psychology. This is good news, to be sure, yet it requires nothing beyond psychology to tell us that a fusion is a psychological simplicity. Search for all other information is quite unnecessary, and the insistence that physics and psychology should coincide at every point is but a symptom of fatuous hankering after causes. The fusion series is, whatever else it may be, psychological, and as such exhibits the independent status of some of the data of psychology. That it is empirical, and open to any investigator who cares to inspect it, goes without saying. For be it well remembered that nothing was ever taken out of the public universe by its being called “mental”, the mental for all practical purposes being only the “not yet mentioned”. And some-

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thing specific has been said on a previous page in regard to unformulated statements, which does not need repetition here.

92. It will be sufficient, in the brief space yet to be devoted to sound, to indicate only a few cases in which the attributes of sensation particularly apply to this modality in a way not evidenced in the other sense fields. The strictly qualitative character of intensity has been shown in connection with intervals, and it as well applies to chords of three or more notes. The latency of sound is very short, muscular reactions to auditory stimuli being the quickest of the sensori-motor releases. Sounds made on musical instruments with many and strong overtones have a roominess (extensity) greater than that of the sounds produced by such instruments as the flute, which is weak in overtones. Duration and after-image concern us in the question of the discrimination of pitch differences. If two tones are successively given to us to distinguish as to pitch, the interval between their presentation, the length of presentation, and the character of the after-image will all determine whether by a good ear they shall be judged to be the same or different. Ordinarily, 64.0 vibrations is in this way just distinguishable from 64.15 vibrations per second;

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and 2048.0 from 2048.36 vibrations. In an experiment performed by Dr. H. T. Moore in The Harvard Psychological Laboratory on Consonance and Dissonance, it was shown that after listening to the prolongation of two tones a dissonant interval apart, the two generating tones became inaudible after four or five minutes,—nothing being heard thereafter except the rattling of the intertone localized within the ears. This illustrates the attribute of exhaustion. Adaptation is too well known, as in cases of the street cars and city clocks, to need further comment. In symphonic music is exhibited to a striking degree many phases of the phenomena of fusion, contrast and clearness. Vividness is well illustrated in the case of the exceedingly low degree of intensity required to elevate the *bel canto* passages of music into focality. Fusions furnish a hint as to one function of consciousness underlying the feeling-tone of sounds, while the pleasantness or unpleasantness of human voices are directly referable to the status of their owners in the social self. Local sign will be especially treated in the sections on space perception. In this connection, also, the vestibular organs of the ear will be functionally related to the responses of orientation.

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Questions on Audition.

1. State briefly, and in the order of their importance, the significant differences between the physics and the psychology of sound.

2. Which of the attributes of sensation appear first in a melody (succession of single notes), as contrasted with those appearing in a harmonized melody (two—, three—, or four-part combination of tones)?

Vision.

93. The gross structure of the eye can easily be demonstrated by means of models, charts, and by the dissecting of a specimen. Structure need concern us only in its connection with function, to which we at once turn. It will be sufficient at the start to indicate merely the course of a beam of light upon entering the eye and its various effects upon that organ. The cornea is of interest chiefly in cases where it is misshapen,—in astigmatism,—that has to be corrected by the use of eyeglasses which, according to the laws of optics, make up for its lack of regularity. Behind the cornea is the aqueous humour, and behind that is the iris, which acts as an accommodation apparatus, functioning the intensity of light. It thus enlarges or reduces the size of its aperture according to the diminution or increase of intensity,

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unless inhibited from doing so by drugs. Its latency is long, as everyone has experienced when going suddenly from a sunny room to a dark one, and vice versa. The lens, which lies behind the iris, possesses a unique accommodation apparatus, likewise, and functions the distance of the stimulus. Muscles at its edge pull it flat or push it into a thickened form, with somewhat less latency than occurs in the iris reflex. However, loss of the lens through an operation for cataract does not preclude the possibility of vision, for a certain correctly-made artificial eye-glass lens will restore the visual function nearly to its normal. In the case of wearing such an adjustable sense organ in front of the eye, it is difficult to draw the line between the physiological and the physical, functionally construed. Similarly, in the use of tele-, micro-, stereo-, and pseudo-scopes, the eye does not end at the cornea, inasmuch as the conscious content we obtain by the use of these instruments is functioned for by the complex of eye-instrument, and not by the use of the eye alone. The function of the lens of the eye is the same as that of any bi-convex lens, and by means of it the rays of light entering the eye are projected toward the retina. If the eye-ball is too long, and the incoming rays of

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light do not reach the retina, a concave lens is used in eye-glasses to remedy this defect, known as near-sightedness; if the eye-ball is too short, as in far-sightedness, the rays focus behind the retina, and a convex lens is used instead. In either case, as before, the functioning eye is constituted out of all that goes to make up the vision apparatus in or about the head.

94. According to the laws of physiological optics, the stimulus for vision is the image of the object on the retina. But this is not a fair statement of the case in psychology. The stimulus for vision is the object which one sees, whether it be something one can also touch, or whether it be some impalpable object in a dream or an hallucination. Of these stimuli for vision, there are two: colors and shapes, which, as has been mentioned before, may be anywhere. By color I mean anything one sees which is not a shape, thus including those contents called grays, whites and blacks, as well as the usual spectrum effects. Insofar as the image on the retina is concerned, it is in and of the object, just as is the wave-length of solar light: just as we hear tones rather than vibrations, so we see colors rather than the numerical status of their wave lengths. In the same manner we smell smells, which may be mem-

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bers of the III, IV, and V groups in chemistry as well, and we feel cold and warmth without first determining their position on the thermometer scale. In pain, the distinction between stimulus and content is even more strikingly made. The history of experimentation upon vision is murky with the conclusions which have been drawn from half-baked tests upon the action of the eye,—cases of the experimenter knowing everything that was going on, and of the subject being interpreted as having only that knowledge which the experimenter chose to favor him with. Bishop George Berkeley showed that we never see depth, but this was only another case of the “unthinkable having been carefully thought out”. By flashing a pencil of light into the eye at an oblique angle, Purkinje showed that one could see his own optical blood vessels out in space, for what reason and with what conclusions heaven only knows; while a certain Le Cat demonstrated, by means of a card and a pin held up before the eye inside of the focal distance that everything we see is upside down! From all these and similar tricks of opticians one needs to be emphatically warned. We may not see depth, but we *perceive* that some things are nearer or farther than are others; and groans need never

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arise from the fact that the retinal image is inverted. The retinal image is not a datum in the psychology of vision, nor do we ever see or feel it. Furthermore, objects are *seen* right side up, indeed just as they are, for the psychological status of the retina is one of functional dependence, and physiological optics holds mortgages on nothing in the eye except the bare physical aspect of the watery media, the cornea, and the lens. We saw, in connection with sound, that certain series had common parts in physics and psychology, while certain others did not at all. In vision, however, we shall see that color sensations are even less tangential to the series of physical determinations than was true in the case of auditory qualities. What else can it be than a downright subtraction from fact to palm off on science a single insignificant phenomenon for the whole cross-section of vision, and to insist that the parts which make up a whole in physics are the only kind of parts with which men of empirical minds can have anything to do?

95. To cite another as well as a last case of artifact in vision, the images of objects falling upon the retina are said by some to proceed to the brain, thence to be "projected" outward into the air into or on top of the object of sen-

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sation in order that vision may be accomplished. This is not only absurd, but more than that, it is a contravention of the entire data involved. In the first place, the "image" never gets into the brain, no more than does the object which functions by it: the very last place where objects sequester is the clammy inside of the skull. The "image", solely an optical datum, is scarcely more than a datum for the unconscious retinal mechanism; it is not a content of visual consciousness,—it is solely a content of inferred consciousness for the student of physiological optics. Nothing gets into the brain at all in vision: the stimulus, or object, sends light into the eye, and this light acts adequately upon the sensitive membrane known as the retina, thereby releasing the neural energy along the neural connections to whatever cerebral localities the function of vision may have specific reference. Objects outside of the head; releases within the head,—nothing more: the periodicity of light waves and the periodicity of neural releases being functionally related and that is all. The actual numerousness of the ether vibrations *may*, indeed, be the actual numerousness of the pulses along the optic nerve, but that would never necessarily

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make the optic nerve yellow or blue while functioning for those particular colors.

96. It is interesting to note that there are two axes of the eye. Where the optic nerve enters on the nasal side in either eye is the point which defines the origin of the optical axis. This does not coincide, however, with the visual axis, which is determined by projecting a diameter through the center of the cornea and the center of the lens, thereby making it strike the retina farther from the nasal side than the optic nerve lies in its circumference. Both of these axes are important: the optical, for it defines the blind spot where there is no functioning for vision; the visual, for it defines the spot of clearest color vision, known as the fovea. Now the optic nerve, upon entering the eye-ball, spreads out in all directions, covering the inner surface of it, and is further formed into minute terminal organs, known by a simile as the rods and cones, which point not toward the light, but directly away from it. At the fovea there are only cones, and at some distance outwards they cease entirely; beginning at the periphery there are only rods, which decrease in number significantly toward the fovea, and ending at that point. The cones function for color and the rods for whites,

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blacks and grays, as well as for the shapes of visible objects. Nocturnal animals have only rods, while diurnal animals usually have both: it is thought that birds and fowls in general have only cones. Nevertheless, these animals do not appear to distinguish what we specifically sense as spectrum colors. In human beings, it is to be remembered, there is a larger area covered by both rods and cones than the retinal space covered by either alone.

97. The following list of visual sensations are to be considered: (a) the chromatic, or spectrum color sensations, which are developed best by beams of light passing through prisms; (b) the white-black-gray series, or achromatic sensations, whose relation to the former are yet to be in all points determined; (c) the color sensations derived by mixing the chromatic and achromatic together; (d) the sensations derived from textures such as pigments produce in solution or spread out on surfaces; and (e) the shape sensations of objects stimulating the retina. One significant thing to be noted in connection with chromatic and achromatic sensations is the paucity of names for the various reds, greens, and grays that are constantly sensed. Another quirk in terminology comes with the determination of the elements one can

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name in every color as distinguishable from each other. As a usual thing, *hue* is the term which means the point in the spectrum series we are referring to in our naming; *tint* or *brightness* applies to the likeness of the spectrum color to pure white light; while *chroma* is taken to mean such things as "the blueness of the blue", and refers to the amount of gray or black not at the time stimulating the retina.

98. Physicists have offered correlations for these three factors in color vision. Correlated with hue is the wave length of the ether vibrations. The longest wave lengths are at the red end of the spectrum, while the shortest are at the violet end, the wave lengths decreasing with ordinal steadiness from red to violet. On the other hand, the changes from color to color are not so steady. For instance, there is much more red than yellow in the spectrum, and much more violet than green, as any casual observer of the rainbow must have remarked. Again, there are many more distinguishable yellows and blue-greens packed into a small linear space than there are hues of any other color. This applies for a constant and equal spectrum intensity only, of course, but the independence of the physical and the psychological series here is nevertheless well marked. Again, even apart

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from the fact that wave length is sometimes correlated with a difference in chroma, (as evidenced by the fact that the most naturally saturated colors are red and blue, and the least yellow and blue-green,—chroma thus being a correlate of wave length as well as of wave form), the wave length as it changes also brings a change of tint, or brightness, yellow being the lightest and violet the darkest color of the whole spectrum. According to a strict dependence upon physics, the correlation of energy should indicate red, rather than yellow as the lightest spectrum color, and blue should be much darker than is the case. As a last case of negative correlation, any sufficiently intensified color is seen as white, and the *minimum visibile*, or the smallest area of stimulus possible, is always seen in the achromatic series. Contrariwise, any sufficiently enfeebled color intensity is functioned as colorless,—on the dark side of the white-black series. This phenomenon applies for diminution of intensity, also, as well as for the extent of the chromatic surface.

99. If one fixates a spot of white on a gray background, while a disc of some color is brought in from the periphery to the center of the visual field, certain changes in the appear-

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ance of the stimulus will be noted. It will first appear doubtless as an amorphous gray, then as a disc of some color allied to the actual hue, and finally as a clear steady chromatic sensation. For different colors, the results will be different; some of the hues will be sensed truly at first focal functioning, while others may pass through several curious stages. The upshot of such experimentation is to ally the extent of cone-covered retina with the functioning of the colors by the retinal apparatus in a very definite manner. The retina has zones of unequal sensitivity to the various hues: the inner zone functions for red and green, the next outward for yellow and blue, while the farthest zone, toward the periphery, sees everything as a series of light and dark grays. The spectrum, when thrown upon this outermost zone is likewise devoid of chromatic character. But these zones are not as distinguishable in function as the above statement might imply. They are weak, rather than blind to the colors they imperfectly function, because sufficient extent and intensity of a stimulus in the periphery can bring out the known hue perfectly well. In moving a patch of color from the fovea to the periphery of the field, it is found that it will keep its color longer than when the stimulation moves in the

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opposite direction. High degrees of energy and brief periods of stimulation are more effective than those of low energy and long duration, which is a principle we found illustrated in certain phenomena of dermal sensitivity as well. But this correlation of intensity with threshold of clear color vision does not necessarily mean intensity as the physicist construes it, for the intensities one meets with in psychology were seen earlier in the discussion of sensation to be other than of a numerical status,—the intensity as well as the extensity of sensation being in a prime series. Vision offers full support to such a scheme of empirical classification.

100. Among the numerous thresholds met with in vision, the following will suffice as a sample of their nature. The *minimum visibile* is a threshold, just as is the *maximum visibile*, or the largest patch of color or visual stimulus which can be seen at one time. These two thresholds would define one sort of series,—the bi-dimensional space series. Another threshold is the color zone threshold for each and all of the colors. The threshold of color identity, of identity in tint between any number of chromatic or achromatic sensations, of the greatest differences in saturation, or the least; the threshold of shape discrimination in the peri-

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phery of the eye, and similar phenomena are samples of the extent to which this attribute can be applied. Any *terminus ad quem*, however defined, could without fancy be called by the same term name.

101. Now while the spectrum appears as a straight band of hues, psychologically it cannot be regarded as such, since various properties of color forbid such a looseness in terminology. In the first place, for every spectrum color, or hue, there is another spectrum color, which, if mixed with it, will produce an achromatic sensation. Thus red and blue-green, yellow and blue, and the like, when mixed together, neutralize each other. But hue, or spectral series reference is lacking in the resulting conscious content. Schematically, therefore, we shall have to regard the spectrum as some sort of a closed series, possibly ovoid rather than circular. The trans-sensational infra-red and ultra-violet series need not be as "long" series as that of the visible hues, for since the spectrum is a dispersion phenomenon, apparent distances in the spread of the dispersed light may be but one of the natural series, and not by any means the fundamental one. There is no need, on the other hand, of insisting that the logic of color,—the principle of color clarification,—be lim-

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ited to the ordinary concept of two or three dimensions. The properties of color mixture, color contrast, after-images, and the like point not to a fundamental principle which maintains the naive naming of colors as the ultimate basis of their existence.

102. Before stating that principle as it should be formulated, let us examine the phenomena which make it both necessary and in line with induction. As to color mixture, not only will certain pairs of spectrum colors produce a gray, but two colors out of such gray-producing position in the spectrum series will produce a hue dependent upon the relative amounts and intensities of the two colors, with a variation in saturation or chroma from the originals due to their nearness or remoteness in the color series. Here one must keep in mind the facts of intrinsic intensity and saturation of the spectrum colors as outlined previously. Again, the double mixing of pairs of colors follows the same laws. Two gray-producing colors will, if mixed with two other gray-producing colors, produce a third gray whose tint is usually the arithmetical mean of the two combinations. In the same manner, red and yellow, which give or *are* that hue we call orange, will, if mixed with a green-violet blend giving a blue of low

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saturation, produce a purplish gray. The formulation of the laws of color mixture is easy within certain limits. For example, the first law can be stated: $C = \frac{G}{c}$, in which gray (G) is derived from any two complimentary colors, represented by C and c respectively,—complimentary referring to *position* in the spectrum series. The second law can be stated in a formula as follows:

$$C_1.C_2 = \frac{w.l.C_1 + w.l.C_2}{2} \left\{ \frac{C_1}{C_2} = \frac{i_1, q_1}{i_2, q_2} \right\},$$

which reads: the mixture of any two non-complimentary colors ($C_1.C_2$) will give a third color whose wave length (w. l.) is intermediate between the first two; in which combination, furthermore, the hue of one color (C_1) will predominate over that of the other (C_2) in proportion as its intensity and quantity (i, q) are greater. The third law of color mixture may be symbolically stated by the use of the expression,

$$C.c = \frac{G}{C^1.c^1}.$$

103. Now, so far as psychology is concerned, identical contents, such as result from fusion (color mixture), are expressed in the same

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terms,—that is, by expressions of identity. Many stimuli are painful, and many combinations give gray. And while psychological simplicity is never to be confused with logical simplicity, yet the “new” things in psychology are just as much terms in science as are the physical terms of the stimulus. For we saw that the fusion intervals in music were a series, just as were the vibration differences which produced them. Psychological simplicity, or *naivete*, must be sharply distinguished from the perception of prime relations between non-physical properties; all we urge is that the chronogenetic order be not taken for the logical one without sufficient warrant. As it is, the two may sometimes coincide, but the point is that their coincidence has importance only *after* inspection rather than before it.

104. Color mixing is not only possible with lights, but with the use of rotating discs, containing various sizes of sectors of pigment colors spread out on various textures. If such a disc is fixated, while revolving, various phenomena will be observed. Suppose the disc to be equally divided between two colors, say yellow and blue, to the right and left of the vertical respectively. One vertical half of the retina will then be blue-stimulated, the other half will be yel-

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low-stimulated. Upon rotation of the disc, that half of the retina formerly stimulated by the blue will first be gradually and then completely stimulated by the yellow half of the disc, and so on,—the alternations of stimulation comparing with the spacial relations of the two rotating colors. The colors are thus retinally mixed. However, a certain rate of rotation is required before complete fusion occurs. At a low speed only a flickering impression will be produced, which phenomenon is actually not one of hue as such, but of tint or brightness,—the speed required to abolish flicker being greater with the brighter colors. The “likeness to white” of the rotating colors is thus actually seen as a partially isolated element. When fusion is finally accomplished by the above means, it is due to the fact of positive retinal after-images, for if the blue sensation had lasted no longer than the blue stimulation, a gray resultant would never have been produced. Part of the stimulus lags behind the temporal duration of visual presentation, thus making one of the terms in color mixture which is independent of the physical nature of the stimulus. In moving pictures and fireworks the same phenomenon of after-images is to be observed. The following special aspect of flicker is also note-

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worthy. Before the threshold of fusion is reached, two kinds of flicker are observable,—coarse and fine; and the brightness of the coarse flicker is even greater than that of the resulting, fused sensation. Besides, upon letting the impression of the rotating disc fall upon the periphery of the eye instead of directly upon the fovea, the number of rotations of the disc per second required to abolish the flicker is considerably greater. The function of the rods of the retina has been previously shown to account for this. If, now, one compares color fusions with tonal fusions, he will see a difference between them on the side of physical quantity. For upon steadily increasing the distance between two tones, after fusion is obtained, the consonance is at once exchanged for dissonance, after which, consonance once more appears, then dissonance, and so on in alternation. Whereas, after color fusion is obtained on a color wheel, no increase in the rotation rate will make any alteration in the character of the fusion so produced. Indeed most analogies of physical quantity have but slight value in psychology.

105. Fixation of a color does not always result similarly. We never adapt to the noon-day sun, on account of its intensity, but are

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always exhausted by it. Besides, such fixation results in the provocation of negative after-images of long duration, the number of them which simultaneously occur being dependent upon eye movements which partially rest one part of the retina, only to be followed by the reappearance of the partially inhibited sensation through irradiation and sympathetic induction from neighboring, over-stimulated areas. For the retina is so sensitive that such a strong stimulation as naked sunlight becomes almost an inadequate stimulus, as is evidenced by the inability to make out the sun's form directly after the first instant of fixation upon it. The combination of intensity and extensity here passes one of the upper thresholds of visual sensation. Fixation of milder colors than the most intense, causes adaptation, by which we mean that every color in the middle range tends toward neutrality,—that is, grayness. But the color does not become grayer, any more than red ever becomes yellow: for all colors *are* a combination of hue, tint and chroma, and “fading out” or “becoming yellow” is the naive name for the fact that either the total sensation is altered by exchanges of identity, or that some physical essential property got called by the name of a psychological inessential. Never-

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theless, through adaptation, the color of blue or brown spectacles becomes less than focally conscious, and wall paper not faded by the sun looks less bright or colorful after a while than it did at first. The fixation of a colored field until it fades (incorrect expression!) followed by the fixation of a gray field, is accompanied by the negative after-image. But this is no enigma, as we shall presently see.

106. For when the eye fixates a colored field, and the after-image replaces the stimulus, both conscious contents are identical in some constituent element. The hues interchange, it is true, but the brightness or saturation remains constant. Color sensations thus oscillate about some identity in their component parts or attributes. The color blind person, who asserts that my red books are of the same color as my green ones, asserts for tint, perhaps, what I assert for that complex known as hue-tint, or even hue-tint-chroma. We saw that the laws of color mixture indicated the gray relation between complimentary colors, and that the tint and chroma of colors are stated in terms of the gray-white-black series of sensations, which terms strictly apply to the fusion of colors into their neutral components. Similarly the laws of the mixture of non-complimentary colors

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laid their main emphasis upon hue as modified by tint and chroma, specifying the intrinsically intense effect of the contributing elements. Now, whatever color may be, the hues as qualities refer also to positions in the spectrum series; which, as evidenced by its various phenomena, is neither linear, nor spacial, nor anchored irrevocably to quantity. Mixing non-complimentary colors toward the red end of the spectrum series showed a numerical resultant that was half of that of the other two colors; while the mixing of red and black, for example, does not give a wave length one can find in physics in the same way. Bare numerical values give small aid here. The colors, called by simple names,—“experienced” if you please as undefinable states of consciousness,—hold an altogether different relation to each other than either the physicist or the introspective psychologist have yet been able to discover. I propose to give that relationship as well as possible in the brevity of space here available.

107. The intensity, or brightness of a color is its one essential attribute. Hue is incidental. This intensity is its psychological intensity, (correlated with its wave length or amplitude, outside of the realm of psychology as far as one pleases), and moreover not predicated of it

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before we see the color, but afterwards. It is a variable corrolary and not axiomatic. The yellow and blue which give gray, give the gray which results on account of the fact that inhibitory conditions between the hues abolish them, leaving the intensities to be algebraically summed into the resultant. Fundamentally, then, the spectrum is a logico-psychological artifact: its linear extent is in no wise indicative of the essential nature of color. The formula $C = \frac{G}{c}$

points to the systematization of the various colors as schematically represented by a right triangle, whose hypothenuse is analogical with the result of mixtures. Schematically only, however, for there is nothing linear about color, nor spacial either, except as the shape series and the color series have compatible relations in tri-dimensional space. With eyes closed, we see a mean gray which is distinguished only in point of brightness,—the fundamental color attribute. Now that gray which we thus see may be equalled by any two complimentary colors, just as it may be equalled by a mixture of white and black. The hues are positions in the spectrum series, it is true, but their positions are of no importance to the visual situation. The correlating of wave length, wave

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amplitude, and wave form with the properties of color is always done with more or less apology, and we may regard the physical vibrations and forms as quite incidental: the various series coincide only with the mathematics strapped for consistency. Certainly a rather tottering basis for color, this numerical fiction; and it is not for psychology to put on a straight-jacket to mollify this incompatibility. Let the two series be as incompatible as they will: apparent homogeneousness is the basis for naivete,—not for logical treatments of data. And yet the question will doubtless be asked, “are not the four so-called psychologically simple colors, red, yellow, green, and blue, more fundamental than the attribute of intensity”? These four colors look to be unanalysable, while, orange, violet and the like, are certainly compounds, or at least can be compounded out of the others, whereas no such thing is possible with these four. But, if compounding is to be made the criterion, all compounding ends with the gray series,—gray being the *terminus ad quem* of intensity, adaptation, mixture and other color phenomena. Why stop with compounding at an irrational point? To the painter, the primary colors are red, yellow, and blue, pigments relegating green to a basis of mixture.

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To the physicist, the primary colors are red, green, and blue-violet, yellow being a resultant of admixing the others. While for the physiologist, the primary colors are whatever few colors can act as equilibrants upon the retinal apparatus, insofar as the color zones of the eye are concerned. Surely that cannot be unlimitedly primary which in this and that field of fact changes its status so readily. Sciences are fields of functions as well as fields of interests, and if a fact is public property, it cannot vanish into subsidiary importance upon being approached merely from a different angle. Now red, or one of the reds of the spectrum and "something bluish", are the only two colors that retain their primacy throughout the above lists of simple colors; but the basis for this is choice among a multitude rather than an attempt to get behind the spectrum as an ultimate series. That only a few of the colors are requisite for mixings by which the others may be obtained, is doubtless exactly the case; but here again psychological simplicity has gotten the upper hand. Red and green equilibrate about gray, and yellow and blue equilibrate about gray also, while all the other selections of primary hues have been made for the sake of finding the fewest spectrum positions which

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will in summation satisfy all the requirements of color. Gray being that about which all these terms of color oscillate, the logical primacy of this intensity is in need of no more defending at present.

108. Color contrast exhibits certain interesting derivatives of the fundamental attribute of intensity. There are also two kinds of color contrast,—simultaneous and successive,—in which the temporal and spacial elements perform their usual unique functions. When a complimentary color is induced during steady fixation, we have a case of simultaneous contrast. When, again, the after-effect is connected with the fixation of a brighter or darker surface than the surface of fixation, the induced or equilibrating color will depend for its intensity upon the elements of the background. Often simultaneous induction occurs,—that is, the return of the original brightness and hue during fixation. Successive contrast is shown in cases of fixation followed by eye movements, in which case the complimentary hue and brightness is induced in the after-image. Contrast is due to the mutual interaction of neighboring retinal areas and is a differentiating process. Adaptation, on the other hand, is a function of duration and acts as a leveling process. The gen-

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eral laws of color contrast are as follows: Contrast varies with the degree of antagonism, and with the nearness of the juxtaposed colored surfaces or lights; it is enhanced by the elimination of contours or boundary lines, is greater when there is no simultaneous light contrast, and increases not only with the saturation of the inducing colors, but also with equal textures, as well as with very simple patterns. However, prolonged experimentation and use of large fields of comparison, both reduce the contrast effects. There is therefore both a time and a space threshold in the phenomenon. This is new in psychology, and is something like the newness of fusion. For colors that are contrasted as well as fused produce an effect not deducible from either naive acquaintance and expectation, nor yet from a study of color effects not involving contrasts and memories of them.

109. Another function of intensity is the Purkinje phenomenon. If we increase the amplitude of the light waves in the spectrum, gradually the yellow and the blue, with a light gray between them, will be the only hues visible, while the orange and red will appear yellower and yellower, and the blue and violet become indistinguishable from a bluish green. But the whole spectrum *shortens*, both ends

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losing their stimulating character. On the other hand, upon decreasing the light energy of the spectrum we get another series of effects. This time orange and yellow drop out entirely, the red gets very dark, while blue and violet fuse into a bluish-violet, with only the green retaining its place and hue. Furthermore, all that now appears is of dark tint and low chroma. The amount of physical change in intensity necessary to produce either one of this pair of phenomena is called the photochromatic interval. Besides, it occurs only to a dark-adapted eye, that is, one that has been accommodated to the dark room in which the Purkinje phenomenon is being exhibited. Neither will it appear when thrown into the eye on that colony of cones known as the fovea. There being no rods at the fovea, the evidence points to this phenomenon as being functioned by those organs. It might be added that the Purkinje phenomenon has the smallest photochromatic interval at the extremes of the periphery,—the permanently dark-adapted or nyctalopic part of the eye. The rest of the retina is hemeralopic, or normally day-adapted,—that is, suited for hue and mean degrees of brightness. Daylight and twilight vision are in evidence when we come suddenly from light to dark rooms, just

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as adaptation is noticed in coming from the yellow lighted theatre after a matinee into the sunlight, where, by contrast, everything looks bluish until the equilibrating functions of the retina have readjusted the field. The colors in hangings and carpets are often selected for their day and night effects, and modern cloth shops sell by artificial light such goods as are to be worn under similar conditions.

110. Evidences point to the rods as the functioners of daylight and nightlight vision. And the specific *sine qua non* of this functioning is a substance in the rods known as the visual purple, or rhodopsis. It is a reddish substance, reacting to intensities of light. Under a bright illumination it becomes first red, and then white. Immediately a pigment in the rods creeps up and covers the rhodopsis, thus throwing them out of action. When the light is dimmed, the pigment cells retract and the visual purple first yellows, and then whitens. In the owl, this photochemical substance is covered by day, while in the night it is uncovered. The owl having only rods, his day-blindness is thus accounted for. If one eye be kept closed while the other is receiving stimulations which affect its rhodopsis, the same effects will be produced in both eyes by sympathetic induction,—so uni-

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fied are the functions of both retinæ. Inasmuch as the bleaching is most quickly accomplished by green, and most slowly by red light, its connection with the functioning for intensities, and especially night and day vision, is indisputable.

111. Flicker and rivalry (oscillating inhibition) may also be obtained binocularly. One eye may get a negative after-image of an object given only to the other. A black patch and a white patch, binocularly combined in the stereoscope frequently produce a silvery lustre, in which case not only the white and black, but the textures of the surfaces bearing them have to be considered. Something like this we have previously met with in connection with the Purkinje phenomenon,—I mean the silvery gray in the green section of the spectrum series. Binocular sensation in this case is combined from right and left eye sensory contents separately brought to focality, and thus binocular lustre is a prime in this series of effects. When flicker is present by virtue of separate stimulations to the two eyes, it can be reduced by giving the same speed in the revolutions of the stimuli to both eyes separately as would be required with one eye directly. Two combinations of flicker separately given to the eyes take the same speed to reduce as is required for both

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eyes together. But when one eye gets a flicker effect, while the other eye gets none, the flickering effect is considerably dampened in the total, semi-fused content resulting from inter-ocular functioning, even despite a considerable range of brightnesses in the flickerless half of the visual field. Another binocular phenomenon is found when, by giving two different brightnesses in the visual field to the eyes separately, a brightness slightly above the mean of the single sensations is produced. This ceases, however, when the original differences are very great, but rises significantly with dark adaptation. It is absent, again, when a dark field is presented first, and when the dark area is very small.

Question on Vision.

1. Arrange the colors of the normal spectrum according to greatest-to-least intensity, and then according to greatest-to-least saturation. Compare these two series, singly and together, with the "natural" succession of hues from red to violet. How many points of identity do you find in these three series? How many similar tendencies do you find? Discuss fully the psychology of color from the above standpoint.

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Perceptions, Meanings, and Speech.

112. Perception differs from sensation in point of structure. Sensations, as representing the attribute-thing relationship, were seen to be cross-sections of series whose terms were to a large degree prime to each other. One might well have wondered what could be deduced from their relationships, for so frequently were they isolated, that bare enumeration seemed the only introduction and farewell they permitted. Nevertheless, simple exhibition is all the scientist owes to elemental properties, and to treat as blunt matters of fact things which exist solely as neutral elements, is the only fair course to pursue with them. The elements of sensation are not mental, for one must go to them without presuppositions. And after one has deduced from them what seems to be their *terminus ad quem*, he must again frankly apply himself to the facts in order to eliminate the cavalier element from his conjecturing. On the other hand, perceptions are examples of the part-whole relationship, subsisting in a complex of simultaneously or successively existing sensations which have a definable logical structure or unity. It now being necessary to distinguish between attributes and parts, we shall first say that for psychology there

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are more specific properties of a whole constituted out of parts, than there are specific properties of a thing made of attributes. There is, indeed, a geometrical increase of such properties for wholes over what it is for things. Again, sensations refer principally to sensory receptiveness or sensory acuity; while perceptions refer more to the motor element in consciousness,—the multiplicity of possible responses to the same stimulus embedded in different contexts.

113. Now the parts in a perception are both sensations and relations between sensations. A patch of red is held up before my eyes, and along with other reactions, I respond to the duration of the stimulus, whether by adaptation, exhaustion or what not. But if a patch of blue replaces it and gets noticed as blue, and if my consciousness becomes verbally expressed by, “‘red and blue’ supervenes the consciousness ‘red’”, with any additional relational conscious content such as, “two after one”, “one more”, or “formerly one, now two”, I am perceiving rather than sensing. Or, to take a more familiar example, “that black thing”, or an object whose color quality alone is being functioned, would be a sensation, in contrast to “that black thing” as “my black silk hat”, which

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would be a perception. It is not a case of the intensity of stimulus that makes the difference, but of the relations between the sensations, and in this particular case, *what I am going to do about the object stimulating my retinae*. It is on the basis of the "with-for" relation that perceptions obtain a rank as focal, forwarding elements in consciousness,—a thing sensations never get. In sensation the time element is reducible to *now*, the space element to *here*; while in perception the time and space elements are never more simply expressed than by the compound expression "*here and now*", their relation of togetherness being for perception, at least, indissoluble. Not that the attributes of duration or extensity in sensation have to change clothes in order to be valid in perception, but only when duration is present as something partly focal and partly fading out of focality, has the lower threshold of perception been passed. Similarly, the spacial element, expressed by the word "*here*" means a sensational element, if everything is equally "*here*." It becomes of a perceptual status, however, if, at the same time there is a "*here*," there is also another portion of the content better expressed by the contrasting term "*there*." Considerable warning needs to be assimilated at this point.

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There may be in logic, but there is not in psychology any necessary distinction between "here" and "there" when these terms are used isolatedly. Do not say that consciousness is the same as speech, for it is not; neither fall into the egregious blunder of verbalizing the item referred to by verbal symbols. There is a logical consciousness, and there is also a verbal or speaking consciousness; just as there is functional consciousness, and a conscious content logically separable from it. Sensations are the warp and woof of perceptions, and perceptions are the stuff out of which logic is made, but that does not allow one to say that the series is symmetrical. Furthermore, the logical distinctions cannot be applied to the sensational sources of consciousness as focal elements residing originally in them, for *the finished product is never the cause of the materials*. Thus "here" and "now" as elements in sensation need have no relational status to what is not here or now. For "then" and "there" might never occur, and indeed, never do occur, to one not engaged in logical considerations, sensation being merely the present, immediate qualitative and quantitative consciousness, and as such out of relation to other and more complicated forms of consciousness.

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114. Space and time have had but slight consideration up to this point. Their relation to sensation and perception is rarely treated with candor. "How do we experience space?" and "What is the psychology of time?" are questions over which much obscurity has been indulged in. It is said, and with truth, that the retinal image of a square table-top viewed obliquely is by no means square. It is, in fact, a spherical surface, with four spherical angles, whose sum is greater than that of the four right angles of the table-top as a geometrical surface. In this case, we are told, memory is invoked, and expectation as well, and many a fatuous explanation as to how the table-top is perceived as square ensues. Likewise in the case of time. A half hour in the captivating theatre, as the classic example, is shorter psychologically than the half hour spent in listening to a sermon; and then we are slyly asked just how we gain an experience of time, with nothing more to depend on than such psychological data. Now let us frankly admit all these facts as well as many more. A person blind from early infancy, who, in later life, has his sight restored, cannot tell the difference between a cube and a sphere if he has nothing more than his retinae with which to function the object. Also, a

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blindfolded subject who is asked to tap continuously an interval given only once or twice by auditory stimulations, will, in the course of the tapping, enlarge some intervals and contract some others, remaining steady and accurate only when the "indifference" period exists between the stimuli. But when all our senses are active, there is a geometrical increase of accuracy in space and time judgments, and so when the question of dermal, visual or auditory space and time perceptions is up for discussion, we always have to remember that a whole has properties not implicit in the properties of the parts; and also that while visual space,—auditory space,—and dermal space-perception, when occurring singly, are all poor, yet, that a summation of space perceptions as given by all these means together is far more accurate than their combined effects would arithmetically indicate. Similarly, in the case of time. Besides, as specifically mentioned before, we have some other means whereby to determine spaces and times than by our naive sense organs, either singly or in combination. Our physical instruments of precision,—mathematically true eyes and ears that they are,—not only function to correct the errors of naive perceptions, but even to correct their own errors as well. Therefore, to

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speak of space and time perceptions as being dependent solely upon the unmathematical sense organs is an example of deliberate self abasement and self delusion.

115. But let us nevertheless exhibit just the extent to which naive space and time are in need of correction. Let us also examine the data by which we ever got the hint for the development of self correcting devices in the attempt to infinitesimalize space and time. In every science, the taking of a set of measurements involves the determination of the resulting value. "Only when" is the scientists' goal in an experiment, and not the goal determined by his expectation. Otherwise, Paddock calls, and careful analysis of the results always show a "trace" of faking. Control of the conditions without hindering the freedom of the function to be investigated, is all the experimenter can ask, though frequently some slight bonus for doing so is smuggled into the final reckoning. But whenever we wish to find some such datum as a threshold, let us say, we take not one, but many measurements. These measurements are not identical, to be sure, but they always group themselves about a common *terminus ad quem*,—about a standard, average, or mean, which may or may not be one of the recorded measure-

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ments. Now this grouping about an average is significant, in that it usually defines what is known as a curve of probability, or a Gauss curve. Such a curve represents a tendency of, rather than an identity between, the measurements,—just as we spoke of the threshold being a quantitative tendency. It is not something peculiar to psychological measurements, but is met with in every set of scientific determinations. Not only is this central tendency important, however, but also is the percentage of deviations from it, as well as their amount *pro rata*; for often two averages, derived from two independent sets of measurements will be the same, while the deviations from these averages will be the only thing significantly describing their differences. It then becomes necessary to pause and see just what numbers mean in such a situation. The rougher or finer the work is done, the greater or less general deviation from the central tendency will usually occur; but in any case, the result sought for will have to be admitted to be not some such unvarying quantity, such as 8, but only a quantity greater than 7 and less than 9. And if any one be disappointed at this, his disappointment of course comes about through the fact that to infinitesimalize space and time, whether or no, involves

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the fallacy of regarding continuity of measuring as necessarily bound up with the discreteness of recorded measurements. Curved lines are not a succession of tiny straight ones, and the mean, or average of a set of determinations is quite useless without their average deviation from that average. This is also why we speak of the diameter of a circle as its most accurate dimension, since the circumference, which is in the prime relation of " π " to it, is incommensurable.

116. Of the many methods possible in experimentation, I shall outline but three. The *method of mean error* consists in having the subject himself reproduce the quantity of the standard measurement as closely as he can. Given a vertical line on a card, whose length he is to reproduce in a horizontal line, for example, the time intervals between the exhibition of standards, and both the accuracy and time taken to reproduce the line are recorded. Exceedingly great variability appears in the results of such a method, as one might expect. The other two methods, the limiting and the constant, are more fruitful,—all the conditions being prescribed by the experimenter. The *limiting method* consists of presenting graded variables to the subject, who judges them in terms of each

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other, giving such answers as "greater," "less," "equal," and the like. Now, in such a case, not only do simultaneity and succession play a big part, but such things as the rightness or leftness of the standard from the variable. The number of measurements often taken in such a case is enormous, in order to cover all the possible permutations and combinations. Furthermore, the threshold may be obtained in four ways: (1) by taking a variable greater than the standard and decreasing the amount between it and the standard until no difference is observable; (2) to start with two equal stimuli and increase their difference until one is much greater than the standard; (3) to start again with two equal stimuli and decrease one below the value of the standard; and (4) to start with one variable way below the standard and approach it, as in the first case above, (1). The *constant method* consists of an irregular presentation of variables along with the standard, with no regular series of differences between the pairs as presented. One reason why these various methods are all employed is that with different material different methods are desirable, so as not to interrupt the function to be investigated. Besides, too slight differences between the pairs of stimuli are deadly to the selective attention

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of the subject, anaesthetizing him against the ability to discriminate. For when only contradictions and negations result, they are taken to mean that one is on the wrong tack.

117. This will give an indication, not only of the method employed to find thresholds and the like in sensation, but of the method to determine naive space and time estimation as well. If we wish to know what "similarity" in psychology means, we take stimuli in which there is something identical, as determined by all possible means, and present them to a subject who has not yet made such a determination. Whatever he takes or mistakes (no distinction here) for identity, is made the basis of similarity. Without any slur on his intelligence, the subject in an experimentation has only to keep even-minded and naive,—it being the business of the experimenter to plan unexpectedancies and keep from coaxing results. That is to say, the experimenter regards the data of the experiment as lying in several series, but the subject's responses are narrowed to the one series about which certain information is desired. They both know equally what is going on, except that the subject is not prepared for the exact order of the presentations.

118. Psychological things have as much be-

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ing as have any other things. *Strictly speaking, there are no illusions.* The psychological order is not the only order into which things get, and by virtue of the world not being a charming and fragrant unity, we have contrasts, contradictions and incompatibilities. Thus the bent stick in water is both a bent and a straight stick, the refractive power of water being a perfectly empirical fact. The psychological (naive ocular) stick, and the physical stick exist cozily together; the one that is bent being made both of wood and of the index of refraction for water, and of certain properties of the eye, while the straight stick is made of wood only. If one be asked whether *the* stick is bent or not, the answer cannot be wrong, no matter how stated; for the question is put in ambiguous language, not specifying *which* stick is meant. Every so-called *illusion* is either due to a tricky question, or to the fact that but one sense is operative where normally all the senses giving data germane to the stimulus contribute to the perceptive consciousness. Naive space and time determinations are not therefore illusions, but merely and frankly terms of series existing with, while being more or less opposed to, those determinations made with that set of de-

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tachable sense organs known as instruments of physical precision.

119. If the subject closes his eyes, and a pencil be drawn over the skin of his hand, and he be asked how long a line it traced, his answer will be naive and erroneous. Our skin is not pock-marked with calibrations, and hence we do not know such things as dermal inches or millimetres. Yet here naive dermal space and time are clearly exhibited. If a bristle be attached to the tine of a tuning fork and the fork is struck and laid on the skin, we cannot count the vibrations, though they may be separately felt. This is the dermal perception of number. If the subject's arm is placed in a tilting frame and gently moved, the extent of the movement will be stated in terms on the basis of which no accurately calibrated scale could ever be made. A single point placed directly in the visual axis of the eye and moved forward or back with reference to the subject, cannot be seen to have changed its position. If the eyes are closed and a clicking stimulus is sounded at various positions with regard to the head, those back and front will be interchanged in the report almost haphazardly, while those from side to side will get into series compatible with what the experimenter knows, and what

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the subject would too, if he did but open his eyes. With the James Artificial Waterfall one can get negative after-images of movement, and of course one asks whether the ribbed belt is actually reversing. The answer is that the physical belt as a whole is stationary, but that certain parts of it which have no position, (having any position whatever), need not be still. That much of our sea-faring friends as is functioned by our timidity, dies in every storm which sets us in a fear, while the ship bearing them may at the same time be making twenty knots in good, calm weather. As with sensation, so with perception; an object is something that will stimulate, and naive perception is not one of the functions of the organism with reference to the stimulus within the encasing environment which can be summarily pushed aside.

120. Naive time perception is a function of several different things. Owing to the nature of the sense organs, stimulation produces consciousness which continually alters as to its focus, unless reinforcements are forthcoming from other means than the stimulus itself. I mean the environment within and without the body. The fading of a sensation out of focality is accompanied by the relational consciousness

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of the change. It may not be called by any suitable name, but is signalized by a difference in focality, a wilting, and is accompanied by a corresponding condition of consciousness nameable either as "before-now-after," "less-more," or "more-less," or some such non-mental expression. Again, the wave of neural discharge rises and falls, while, for example, the pulse is beating, or the breath being drawn or released. These general organic rises and falls are the physiological basis of naive time perception, and the word "now" means any neural continuity or equilibrium which is homogeneously focal in consciousness. However, "now" or "the present" may be regarded as just as long as the uninterrupted neural discharge. When a writer says, "Let us *now* consider, etc.," he means that he wishes his readers to have a focal consciousness whose content is his ideas for just as long a time as it takes to peruse his statements. If the backgrounds of consciousness are steadily maintained, "now" is a function of that maintenance. "Now" and "then" are also interchangeable: any reference to events in time past, taken as a whole, means a "then." But the sensorial "now," or the present time, is always short, while the perceptual or logical "now" may be as long as one pleases.

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That is to say, those things which are axiomatic and always dependable are timeless, being indifferent to any special time or situation.

121. Time estimations concern such things as the following: the number of objects operating in the sense field; the strength of the first impression,—or the strength of some one of the impressions as contrasted with the varying strength of the succeeding or simultaneous impressions; the contrast effects of the succession of unequal intervals of solar time in a series of presentations; the alternation of sense fields in focality, and similar phenomena. Sometimes the expressions “filled” and “unfilled” time are spoken of, but this means that *interest* dominates the items in the content, and not that the time interval is quantitatively altered. One curious fact in this connection is the “indifference period.” The motor repetition of certain time intervals will be erroneous unless the interval is some multiple of about 0.7 seconds. This particular naive “second” is remarkably accurate. Again, if one sits in a chair resting the tendon under the knee upon an elevation too high to allow the heel to be comfortably held on the floor, and starts to jerk the heel up and down, the ensuing reflex will continue in spite of all volitions to the contrary while re-

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maining in that position, and the regularity of the interval thus maintained will be a close involuntary standard of time. The sub- and unconscious always function more dependably than any one sense field, no matter how focal it is. Rhythm may be spoken of as the involuntary grouping of regular stimuli into patterns, the basis of which grouping is in the subconscious action of the neural arcs. Multiple, rapidly recurring stimuli are not responded to separately, but they sum into releases as has been indicated before. The initial reflex and the after-discharge are veritable elementary constituents of the trochaic foot in poetry. And no rhythm whatever has been successful which demanded grouping contrary to the elemental properties of the discharge mechanism of the neural arcs. As certain geometrical figures are to lines, so rhythms are to time intervals; the basis for spacial grouping being extensity, that of temporal grouping being intensity. We shall treat of the other features of time in connection with space, with which we shall have considerably more to do.

122. The following psychological space-givers are usually enumerated:

(1) the bi-dimensional field of the passive skin,

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(2) the bi-dimensional field of the active skin,

(3) the tri-dimensional field of the passive skin,

(4) the tri-dimensional field of the active skin,

(5) the bi-dimensional field of the passive, single eye,

(6) the bi-dimensional field of the passive, double eye,

(7) the tri-dimensional field of the single and double moving eye or eyes,

(8) the bi-dimensional field of the ear, or ears.

Smell and taste, as well as the organic sensations, are spaceless, though not lacking in the attribute of extensity. By "spaceless" is here meant that they cannot be developed into perceptions that will square with the readings of detachable sense organs. One dimension can be gotten easily from either the skin moving over a point or a point moving over the skin. But a square, circle or triangle outlined upon the skin is poorly judged to be a closed figure unless the stimulation is intense enough to leave definite after-sensations. Otherwise the first impression of the stimulus will give an eccentric spacial reference. A temporal threshold

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must not be exceeded here either, for otherwise, the after-sensation will be excentrically referred. Local-sign, duration, after-image and the like, thus pass over into perceptions. A geometrical figure in metal, when laid on the skin, will likewise require a certain intensity of application to be judged correctly as to its shape. If it has sharp corners, they are likely to arouse pain before its sides fully arouse touch, in which case all the elements in the perception of its size will be derived from the various systems of cutaneous sensibility rather than from superficial (or epicritic) touch alone. A warmed dollar feels larger and lighter than a cold one, if both are laid simultaneously upon corresponding parts of the body, this being due both to the engorgement of the capillaries through heat, and to the numbing of the skin through cold, thereby making the skin itself a tactual stimulus. If a heavy, blunt point moves across the skin surface at the same rate as a lighter, finer one, the judgment of rate of motion will err in point of underestimating the speed of the second. In all these cases of dermal perception, there must be considered the matter of the "pressure gradient." This refers to the deformation of the skin by the stimulus. The hand immersed in mercury will respond

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to a summation of touches only at the line of emergence from the liquid. Below that point it will function a mutual inhibition of them. This is due to the exceedingly unusual pressure of the liquid at that place as compared with the pressure of the air above it. Contrast is here the deciding factor. In cases of the pressure gradient, the distribution of pressures from the point of application becomes such that irradiation occurs,—a factor which accounts for some of the eccentricity of dermal local-sign,—for some of the outlying areas beyond the stimulus will be subliminally excited, and, by virtue of the lateral pressure of the deformed skin, the non-orthogonal character of the entire stimulation will be functioned erroneously in the judgment given. Pain, in its quick lancing down, and cold in its contrasting thrill, are better localized than those other sensations which have less instant contrast effects, regardless of latency or intensity.

123. Dermal perception of space is also obtained by the moving of one skin area over another. All three dimensions can be thus exhibited,—the vertical, the horizontal, and the third dimension called depth. But this almost always involves tendinous and articular ingredients, and while the threshold of bare movement is

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low, judgments of the extent to which the legs or arms have moved, whether singly or in pairs, are usually quite inaccurate. For example, a slow movement seems longer than a rapid one of the same extent, while the judgment of a blindfolded subject, who determines his two arms to pass symmetrically through the same distance, errs. The movement of the limb mentioned, noticed and kept in focus is always overestimated, though the extent of successive movements is better judged than that of simultaneous. Along with kinaesthetic sensations, there is usually present either coolness or warmth from the skin due to the fanning of the air by the moving member. This, however, often gives cues as to spacial differences in the resulting perception. Extents of movement, durations, and qualities,—that is, the local sign of the articular elements in toe, hip, shoulder, wrist and the like, together with the massiveness of the fusions from the large joints,—these are determining elements in all cases of kinaesthetic perceptions. Curious among the eccentricities of naive perceptions is the familiar “size-weight” illusion. If a subject is presented with two objects of similar shape, but of exactly the same weight, and takes them both simultaneously and lifts them, the smaller of

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the pair will appear heavier than the larger. Furthermore, the larger is not only "better prepared for" muscularly than is the smaller, but it gets lifted more steadily and, due to the muscular "surprise" provoked by the other weight, gets lifted more rapidly. Other things being equal, the more rapidly a lifted object ascends, the lighter it seems. The experiment is usually set to deceive, and could be called an illusory phenomenon only in point of the verbal report of the subject upon suffering the joke. Otherwise, it is but a case of co-conscious perception as functioned by movement on the basis of inequality of visual responses to sizes. For the motor setting with which we approach such unequal objects is usually derived solely from their space relations, and not from the intended movements giving a sub-focal, strain pre-sensation. There is such a thing as a yellow consciousness, an angry consciousness, but there is no such thing as a heavy consciousness: we function for weights only by strains. This point of pre-sensation, pre-perception and motor attunement will be further treated of in the sections on "meaning."

124. Before elaborating auditory and visual space perceptions, I wish to outline the sensational elements in all perceptions. Under the

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concepts of the attribute-thing and part-whole relationships, sensations and perceptions are differentiated chiefly by the complexity and concatenation of their elements. Perceptions, being linked with motor responses of general orientation, in a way which sensations are not, illustrate the "with-for" relationship in its most significant aspect. The clearest consciousness is perceptual, not sensational or emotional, and the motor acts of the body are not only the surest, most maintaining, and least fatiguing, when the perceptual responses are dominant; but perceptions at once lead to organizations of activity, judgments, reasonings, clear conceptions in a manner not ever approached by other kinds of responses. Now, those attributes of sensation which lead directly to perception are the following: fusion, duration, intensity, local-sign, contrast, and after-image. I shall take them up separately.

125. *Fusion in perception.* Every whole has properties other than those of its parts, taken isolatedly. There may also be more properties of the whole than the addition of those of the parts would indicate to be the case. Now insofar as fusion typifies wholeness, a fusion resultant manifests the specific properties of a whole. A fusion resultant, furthermore, is not

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the same as a simple sensation; for a fusion can be broken up into several sensations, while a simple sensation breaks up at once into attributes: besides, the elements of a fusion still have position in space and time, while the attributes of sensation do not. It is possible, also, for the "position" of the fusion resultant not to coincide with that of any of the constituting sensations. Nevertheless, fusions give us a clear example of the addition of one and one to make but one,—as is evidenced by the two compass points placed on the skin within the dermal threshold for twoness. In such a case of fusion, also, we have exhibited the fact of the submergence of some of the properties of the parts under the new quality of the whole, or resultant. If, again, such a fusion be gradually consummated and then gradually broken up, one may get a clear perception of change as well as of rate of change,—two factors both of which facilitate orientation in any recurrent meeting with either the elements in, or results of, such fusion. Lastly, identity and contrast may be obtained along with fusion, with the probability that each may supplement the perceptual value of the others. For instance, if tickling be produced first by light wool and later by a vibrating tuning-fork, while the sub-

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ject obtains both visual and dermal contents from the stimulus, he will dermally sense identities but visually sense and perceive differences. This will automatically evoke contrast in the resulting consciousness and all of the elements here involved will make a perceptual pattern of larger dimensions than would otherwise be possible. Such an account will fail to satisfy the incurable introspector,—for he wants to know in all such cases how the object is *re-presented* in consciousness,—not what of the object is first of all just plain consciousness. But this is asking what the “mental” status of an object is,—an item we have long ago relegated to the vocabulary of metaphysical profanity.

126. *Duration in perception.* The fading out, wilting, or sudden onset and release of a stimulus, accompanied by whatever content or process is functionally related to such things, brings with it, or has as part of it, the corresponding consciousness in point of duration and its relational aspects. The duration of a content or process means also the passing of a threshold of the perception of relations. This temporal attribute of sensations welds them together into the causal or symmetrical relations of perception. It is a primitive and ultimate at-

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tribute, and is to be correlated directly with the rise and fall of the neural releases. Duration, including simultaneity and succession of impulses, is a bi-dimensional field, and by virtue of temporal duration we are enabled both to sense together, and sense successively, as well as perceptually function the discrimination between pairs of intensities, local-signs, durations, and so on. The overlapping of neural impulses is the physiological element operating here.

127. *Intensity in perception.* The more intensive stimulations usually capture the final common path, and thus get soonest organized into perceptions. If, also, there be differences of intensity in the conscious manifold, they will be functioned as a series of intensities in addition to whatever other series the stimulations may exhibit. Were it not for differing levels of receptiveness, most objects would otherwise be recorded as "Blob No. 1," "Blob No. 2," etc. A series of psychological intensities in one modality, however, may be contrasted with data from another sense field operating at the same time, and thus better balance and orientation may result.

128. *Local sign in perception.* The position of every sensory stimulus is more or less determinable, and the resulting sensation is func-

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tioned as being derived from some part of the spacial order; however, the Euclidian position and the reported position need not coincide. We saw in the case of touch, that when two compass points were placed on the skin within that distance known as the dermal threshold for twoness, that the local sign of the resulting sensation was either absorbed by one or the other of the points, or was referred to something like a mean position between them. Likewise, when only the deep sensibility is left after nerve section, successive, and not simultaneous double pressure alone remains. Now, whether local-sign be a quality peculiar to every *direction* of stimulation or not, there is soon derived with practice an increased sensitivity to location, and practice also improves spacial discrimination on that side of the body not exercised. In all cases of location, two senses are better than one, and differences of position are responded to better than are single positions. But, as said before, we are not calibrated as meter sticks are, and questions put to us in regard to the sensorial position of things have no right to be couched in terms of the experimenter to the disparagement of the subject. Any response is a respectable datum in psychology.

129. *Contrast in perception.* Togetherness,

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whether simultaneous or successive, is accompanied by partially balanced neural responses, and this balance is part of the basis for the perception of the pattern of stimulations functioned in consciousness. We sense differences rather than absolute magnitudes, and this fact has a cash value in perception. Gradual increases or decreases in intensity of the stimulus are not usually accompanied by equal slidings in the content of consciousness, but abrupt increases or decreases are the rule. The steady "stream of thought" is something which the writer, for one, knows nothing about. Instead of being continuous, consciousness is discontinuous,—arguments for continuity on the basis of anything but breath or pulse being incomprehensible to him. In this connection, it is logical to distinguish between the perception of contrast and the sensations that are contrasted together; nevertheless, in psychology either may be now primary, and again derivative.

130. *After-image in perception.* Structures are also revealed by duration and other continuing phenomena. The after-image is such a functioner of structure. Both positive and negative after-images, insofar as perception is concerned, each add just another term in the series of possible contents derived by the sense or-

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gan. Often in so doing they give common parts with the effects of other stimuli. Thus they relate things which might otherwise go unrelated for a considerable time, and by lasting longer than the stimulus presentation, they afford contrast effects, whereby further bases for perception are established.

131. There is thus nothing mythical in the sensational contributions to the elements of perception. We have specifically dealt, however, only with the response side; but inasmuch as the sensation is the object and what it will do, we have only to indicate the way structure is first functioned,—for it is always the object which is a structural experience as well as structurally experienced. Indeed, the object sensed and the object perceived differ in only two respects,—namely, the structure of the neural releases, and the structure of the environment in which it is being functioned. All these structural relations are logical and empirical, and have none of the odor of “mentality” upon them.

132. Now for *space perception*, especially as related to the eye and the ear. Let us first bear in mind the fact that the study of space with reference to the naive ear and eye is not a study of how space is *made*, space never having gone

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through any mill or shop, but only how space and spaciality are functioned. For the study of psychology is principally an analysis of what we already well know, as well as how things get known; and it determines the properties of parts in a whole whose parts are not yet fully determined as to their contributing elements. Consider the following list of sense-fields:

Visceral and coenaesthetic sensations,
Taste,
Smell,
Touch,
Kinaesthesia,
Hearing,
Vision.

As named in the above order, they represent not only that order in which they are the worst-to-best space givers, but also that order in which they have, with one or two exceptions, the least-to-most structure. Not only this, but they have in this order an increasing number of qualities, and therefore exhibit correspondingly numerous instances of variation in the combination of attributes leading directly to perception.

Ear Space.

133. The eyes converge and focus, but the ears do not. The tensor tympani contracts upon accommodation, and the tympanum func-

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tions sudden intensity in the manner previously described. But ear space is obtained by the relative intensity with which sounds are gotten by the two ears, barring one notable exception,—the human voice. This can be very well localized front and back, while all other sounds are in need of being placed well within the lateral field of sound with reference to the coronal and sagittal planes of the head. The shell of the ear (concha) also acts as a resonator, and performs a localizing function. There is also a widespread and clearly manifest tendency to locate a relatively loud sound in front of, and a relatively weak sound behind, the head, but just what the zero of intensity (loudness or weakness) is, in such cases, has not yet been determined. Furthermore, the straining of the eyes to right or left causes a misplacement of the sound in that direction, and every reflex tendency of the head adds an element in the determination of space while the eyes are closed. Sounds full of overtones are naively localized nearer to us than sounds poor in overtones, while the “flatter” of two sounds seems to be the farther away. Fusion in sounds offers an interesting analogue to fusion in touches. If two similar sounds be produced at certain different positions with relation to the head, they

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will invariably be heard as one, in spite of the fact that the subject knows there are two of them. The position of the fused resultant will be either, (a) the actual position of one of the stimuli, (b) at a point between them, or (c) eccentrically referred to an indeterminate position.

134. Again, if an auditory stimulus is carried toward the head, the localization of it will be functioned with the same result as if, with the stimulus fixed, the head has been moved in the direction of the source of sound. It is the moving things of nature that give us our best cues of position, and ear space furnishes a field in which these operate. Within the internal ear lie the semi-circular canals, as well as two conjoined organs of spherical shape known as the saccule and utricle. The canals are set in the three geometrical dimensions, and are full of a liquid that gets impacts which develop wave forms in the tiny tubes of these canals when the head is moved. Extirpation of them impairs our perceptions of position; but one of each corresponding pairs of canals on either side may be removed without apparent loss of this function. Only when both vertical, or both horizontal canals, for example, are extirpated, will such perception be inhibited. The saccule

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and utricule have on their internal surfaces tiny hairs upon which lie crystals, whose function is thought to be to exert pressure during sudden movements of the head or body, and thus to arouse stabilizing reflexes. Deaf mutes very frequently have defective inner organs of the ear, and the common inability of these persons to locate themselves in under-water swimming, as to the surface and bottom of the pool, is correlated with this fact. Interesting sidelights upon dizziness are revealed by incidents in connection with our modern conquest of the air. One of the important things that has been shown is to how great an extent the environment of the aviator may be rigidly defined by his aeroplane, with but little reference to the surrounding medium. Spiral somersaults are soon learned without any feeling of dizziness. From a recent magazine comes the following quotation: "A naval airman when flying seaward entered a thick white cloud and wholly lost his sense of direction. He only realized that he was upside down on finding that things were falling out of his pockets. . . . At length he emerged from the cloud and saw the sea apparently over his head, but was able to right his machine and continue his flight." In rotating the body rapidly, we produce the phe-

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nomenon known as dizziness, which might be classified under sensations of movement, as well as under perceptions of space. It is accompanied by eye movements, nausea, and displacements of the viscera, which,—being less stable than the bones,—alter the center of gravity of the body when they are disturbed. In this case also undoubtedly the kinaesthetic organs of the internal ear function importantly. Looking in a mirror whose position is suddenly unsteadied will also give a sense of dizziness. Toe-dancers obviate the inevitable dizziness incident to their rapid rotation by fixating one object after another before they arrive directly in front of it; or else, with eyes closed and directed downwards, they attain the same end. When one observes the eyes of a person who has been rapidly rotated, without any of these precautions being taken, he sees an involuntary rotary movement of the eyes, called nystagmus. This nystagmus may be lateral, (that is, the eyes may jerk rapidly from side to side), or rotary, but it is rarely vertical. During rotation, there is a tendency to fixate any stationary object, but it soon gets left behind, and we look quickly forward to fixate another stimulus. During this look forward there is no vision. After slowing up, a contrary effect is produced;

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the eyes of the subject jerk quickly back and slowly forward, the general effect of this being being to function the surrounding objects as rotating around him as a center. Some people lose their sense of orientation while watching a waterfall, as this is a form of flicker, while intoxicants, and strange eye glasses, as well as disturbances in the circulation all have common parts in this phenomenon of mis-orientation. Even to pass a galvanic current through the ears produces dizziness, and one may have sensations of falling toward the cathode pole in such a case. But neither this nor the oscillations of the eyes accompanying it occur when the labyrinths are removed.

135. In all these cases of confusion, there are several significant things to be noted. In the first place, the organs of accomodation and adjustment act with longer latent periods than allow instantaneous readjustment to an environment whose relative positions are shattered; and the consciousness generated in such situations is the situation itself pitted against the responses to that other environment which has no especially significant name, but which is mainly functioned by the tonic reflexes that react against all such disturbances. Furthermore, while the perception of confusion may be

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a confused perception, all of our responses at any one time need not be confined to those elements which are focally conscious. A confused environment may lie within an unconfused one, and part of the stabilizing influences may come directly from the responses to this other environment. But at the time, these responses are not focally conscious, and need not have any content; they may be treated of entirely in terms of the general somatic momentum, which after all is but a response to whatever stability is present. For human beings are constant functions of their environment, whether they be manifesting sensation, perception, volition, belief, or judgment. And if any one wishes to know what "mystery" lies behind these other stabilizing environments, the only reply is that the non-mental elements which make up both mind and matter have other orders than those into which they may be and are constantly organized as sensory data; and being non-mental as well as non-physical, they have no age nor settled occupation.

136. Of all the modalities, sight is the one which figures principally in spacial perceptions. Not only are the combinations of sight and touch, sight and sound, sight and movement, better space givers than any such two-term com-

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bination not including sight, but also our instruments of precision are usually adjustable sight organs rather than organs co-functioning with the efferent nerves of other sense fields. Telescopes, transits, sextants, and range-finders, for example, are all visual apparatus, and even the physical measurements employed to determine time and intensities are calibrated into scales which we read with the eye rather than perceive by the use of the other receiving organs of sense. The domination of all other spaces by sight space is apparent, and we even employ in more than a figurative sense the expression "seeing is believing," when we are in doubt as to the factual status of the something under suspicion. The functional dependence of perception upon the eye is not difficult to make explicit. No other single organ can receive so many impressions and group them, while at the same time it adjusts itself to their differences, as can the eye. For three sets of functions are implicit in its action,—movement of the entire organ by rotation within its socket; accomodation of the lens by the ciliary reflex; and the color and shape responses quite independent of these two. The amount of space responded to by the eye so far exceeds that of any other sense organ, that, if by the expression

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“higher sense” is meant the possibility of organized and dependable perception, no modality is in any way superior to vision.

137. Convergence and accommodation are two motor responses of the eye which aid significantly in space perceptions. Convergence accompanies accommodation, and any intense stimulus for vision will set going automatic rotation of the eyes to bring the object directly in line with the visual axis, as well as adjustment of the lens to the focal distance required for clear vision. The two eyes converge and accommodate as one, and by means of producing convergences and accommodations under artificial circumstances, the distances of objects thus seen will be functioned by the extent of the automaticity of these processes. Exceedingly distant objects make no apparent convergence in the eyes: the axes are practically parallel, as is the case with persons asleep; and the “far away look” of one in abstraction or in a condition of surplus eating is directly referable to the non-fixation of any sensory stimulus. Objects will appear then, in this connection, as far away as the sensations of reflexly excited accommodation and convergence function them. But we must also take into account the matter of visual distance, and what it means. When

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things are found out to be nearer or farther than they appeared, it cannot be called a *visual* illusion. Depth or distance, visually speaking, is as great as it appears to be; but depth or distance in terms of *intended movement* to reach the object, is as great as it is found out to be. Of course, in eye-consciousness, one must consider that there are many unequal linear extents which are functioned exactly alike,—they have common parts,—and these visual identities are just as good data as any others. Let the cause of the eye, and not the eye itself be the *emptor qui caveat*. *What we were set to do on the basis of regarding these common parts as in one series only*, is the basis for error; and this is a case of contradiction in the resulting movements, not an error of the visual content. The exact basis for erroneously calling this a “visual illusion” is the violation of the part-whole relation,—that is, the making of the whole consciousness independent of its contributing parts and relations.

138. The so-called retinal image, or, for our purposes, the extent of retinal stimulation, has an immediate bearing upon the functioning for extents and depths. According to physiological optics, the size of the stimulated retinal area is directly proportional to the size of the ob-

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ject stimulating it; and thus whatever object can be made to stimulate a smaller retinal area than it normally would in its spacial context, is called more distant than normally. The clearness or faintness of the stimulated retinal area has much to do also with the visual estimation of size and distance. Irradiation of light on neighboring retinal areas brings an inevitable distance effect, as well as does the stimulation of the retina by objects in a fog. But here haziness causes us to function the objects as much nearer for vision than they are in motor terms, whereas their vagueness of outline makes them appear farther away than one would expect. Moreover, objects nearer than the fixation point seem larger, and those farther away smaller; while if there are two objects directly in the line of vision, and the eye first fixates the farther and then the nearer of them, there will be apparent a doubling of the object not fixated. Holding a meter stick directly in the line of sight, and looking first at one end, then the other, and then at the middle, will cause all the blurring which any mis-focussed optical apparatus is heir to under similar circumstances.

139. Before taking up this phenomenon of doubling in detail, let us consider one difference between monocular and binocular vision

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on the phenomenal side. If a ring is suspended before one with its diameter in the median plane of the head while one eye is closed, the task of thrusting a pencil quickly into the aperture of the ring will be far more difficult than when both eyes are open. But the error is not so much one of *direction* as of the *amount* of distance at which the ring is estimated to be. If the ring moves, and any co-ordination between vision and intended movement is thereby obtained, the trials will result in far greater accuracy than otherwise. Nevertheless, the determination of the amount of movement the ring has to make before accuracy of thrust is obtained, is of slight account; for there would be no basis on which accuracy with both eyes open without movement of the ring, could be equated with accuracy with but one eye open while the ring is moving. These two situations are prime to each other, and psychological primes *may* all be substituted for each other or not, just as environmental and intentional conditions determine. But so much does movement enter into perceptions of depth, that the eye must be regarded primarily as a motor mechanism whenever we wish to refer the data of *space getting* to it. For if we produce experimentally an apparent monocular visual *im-*

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passe,—unless it be flashed on and off instantaneously to the subject,—involuntary accommodation and re-accommodation occur, since the eyes are almost never still, even though we introspectively judge them to be so. Again, the two retinae do not function singly, however independently they may elaborate their stimulations antecedent to the full neural discharge accompanying focality. So that while uniocular depth may be obtained, especially with movement, one must be warned against assuming that the closure of one eye is accompanied by the exclusion of unconscious binocular, accurate functioning of space.

140. As a matter beyond dispute, however, depth can be obtained in too short a time to allow for any eye movements, and while just how great a depth is therein apprehended is not quite clear, *any depth at all* would be sufficient evidence of the fact that space is not a matter of what some psychologists incorrectly term *experience*, for spacial content is one thing, while the study of the functions whereby we get that content is quite another. Furthermore, to find ourselves accurately and prudentially oriented among our surroundings often means that motor habits have improved upon the sensory content of vision to a large degree. The lowest

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levels of consciousness are devoid of content, but they are not on that account lacking in those functions out of which accurate judgments may still be made. To treat then of binocular space, we have to consider first the fact that when the eyes are focussed, this functioning defines the field of vision in terms of the point of focus. Everything beyond and nearer than that point fails to arouse the same sort of definite stimulations from the eye sockets; as well as it fails to open such co-ordinating pathways to intended movements as does the fixation reaction, to which all others are subsidiary. One cannot converge his eyes in the dark correctly, and exact fixation of its source is impossible after a light, once shown, is obscured. If we turn out the electric light before retiring, not only will the exact position of the lighting fixture be lost to consciousness, but, in a strange room, all movements of orientation will be suddenly swamped out of the motor pattern except the vaguest remnant of our previous intention. "Groping in the dark" is just another way of saying that intended movements guaranteed in their integrity by the element of visual fixation have been geometrically decreased by the bare arithmetical loss of the guiding eye, in point both of accuracy and chain continuity. Now,

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as a usual thing, one is led to believe that the physiology and psychology of vision have made an inseparable contract. The notion of the exact correspondence between the amount of convergence of the eyes and the apparent distance of the object from the observer emanates from the very bosom of physiological optics, as well as the impossibility of single vision when non-corresponding points are being stimulated. Previous to that notion there was much support given to a derivative of the laws of optics known as the projection theory. This fell out of that opaque philosophical era in which the mind was considered a mirror of the objects of the "external" world. And yet the mind was in the brain, though the brain, strange to say, was also external! These were also the days when the mention of certain unctious words was inevitably followed by the stupefaction of the non-elect. Now although every observation may contribute to science, and while the search for ordinal correlations is symptomatic of one form of an orderly mind, yet any one who experiments upon vision and tries to ordinally correlate every visual phenomenon either with one of the laws of lenses or the laws of physiological optics exclusively, will find that instead of obeying the laws of nature, he has but

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obeyed the laws of the logic of intention. We do find, it is true, that objects falling on non-corresponding points of the retinae,—that is, upon points geometrically non-identical,—produce usually double vision of the stimulus. As a matter of fact, however, we get too few double images for the theory of identical points to be unlimitedly applicable, and too many for the notion of projection to be entertained. Important work is being done at present upon this very item of binocular vision, and the general tendency of writers is to be catholic in the use of conclusions. At present, also, depth or solidity is being explained by saying that it is functioned by retinal conditions which exhibit a half-way state between single and double vision. For while we never see double at the fovea, neither does the marksman see two targets, nor the microscopist two specimens, though both of his eyes are open. To say, furthermore, that the eye not at the slit of the gun nor at the eye piece of the microscope sees nothing, is perjury to the facts.

141. For, if explanations of vision are to be through and through optical, or physiological,—in order to satisfy some a-priori theory of mechanism,—then, of course, at inconvenient places some such psychological (!) factor as

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"habitual neglect" of the disturbing fact must be solicited in the final reckoning. For even stereoscopic effects of depth persist not only when the eyes are converging, but even when they are parallel, and when they are diverging as well; and distances can be discriminated as far as twenty metres, when kinaesthetic factors or retinal disparity are negligible. "*Neglect* of the extraneous elements,"—by which is usually meant some "mental" *hocus* which is invoked to lubricate the irritating fact,—will not serve as an explanation, unless it be allowed to serve whichever side such a factor as "habitual neglect" or "convenient explanation" may pragmatically be called upon to support. Otherwise, "experience" and "habit" might become terms of no meaning! "Neglect" or "experience" have nothing to do with the laws of optics; but so hard put are any and all purveyors of the insurmountable duality of stimulus and content, that the convenient explanation becomes the one of greatest validity. Now the eye, besides being the functioner of vision, is a spherical body, whose optical effects are thereby often translations of plane surfaces into sphericities. Let one consider along with this the phenomenon of irradiation, the fact of much more than foveal vision being functioned nei-

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ther as infra- or ultra-foveal perspective, the fact of *some* indisputable monocular depth, of *some* instantaneous depth, and many other phenomena, and he will be factually obliged not only to infer, but imply as well that the series of physical phenomena, the series of physiologically-optical phenomena, and the series of psychological space phenomena are three series, each as empirical, each as independent, and each as likely to have as not to have copious common parts with the others. In brief, there is a relation of functional dependence rather than a numerically causal relation existing between all these terms; and only the barest, and one might almost say inessential, correlation exists between *all* the terms of any one series, and *all* the terms of any other. But here is the main point, that incompatible as all these various series may be, term by term, their summation in all functioning for space may become self-corrective of any discrepancies in the partial explanation which any one of them may afford. Motor adjustment, on the basis of the cumulative effects of re-fixation, accompanied either by the eye itself moving or the stimulus being moved about, has, as a total complex in the cross-section, such a geometrically greater effect than the simple arithmetical summation of

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the separable data might lead one to expect, that the question of how we *get* space is quite subsidiary to the question of how accurate is the space *so gotten*. And this question is finally answerable by reference those ultra-ocular instruments of precision mentioned before,—I mean by reference to the ability of two constructing engineers to make their separate tunnels meet in the middle of a mountain, or to the ability of the gunner to demolish a target whose position is relayed to him by monoplane, telephone, and the calculus.

142. The insufficiency of such an account of visual space may perhaps be condoned on the strength of a brief mention of certain geometrical figures which are always cited as evidence of the tattered character of optical impressions. I mean the Mueller-Lyer, the Poggendorf, the Zoellner diagram, and others of their kind. Likewise, "Mach's Book" is often cited as especially telling evidence against the stability of space. One word only must suffice in our treatment of this and all similar material. The "illusory" character of all these figures consists in the questions asked of the subject who attends to them. For example, if one is asked which way "Mach's Book" is open,—toward one or away from one,—the answer is that it is

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turned in either direction, just as it appears to be. It is equally either, since it contains the perspective elements of both,—*it is all common parts*, and has no exclusive relation to one aspect or the other. I'll even wager that it was drawn with this very end in view. The Mueller-Lyer figure, while depending largely upon the motor element in vision for its emphatic effect, is a figure about which only tricky questions can be asked. "Tell which line is the longer," as a sample of the instructions given to the subject, should be replaced by "*which figure gives the more contracted effect?*" For the threshold of this contraction can be easily found by the rotation of the movable arrows about their axes, and the whole "illusion" depends upon the absorption of one set of local signs by another,—a thing we found in connection with compass points and intertones, and which we are as likely to find again in still a different set of phenomena as well.

143. This ends our particular treatment of sensations and perceptions. Be it known, however, that some of the attributes we found in sensation apply also to perception. For instance, the time elapsing between the presentation of such an object as a marlinespike and the comprehension of it as a splicing instrument,

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would be called the latent-period of perception. The latent-period ending, the threshold would be reached. Again, perceptions summate, as for example, when a commander surveys the intricacies of a general engagement, and decides upon the particular efficacy of bayonets or cavalry sabres to turn the tide of affairs. We adapt to perceptions also. Indeed, one of the clearest ways to define analytically the difference between sensation and perception is to enumerate the attributes which both exhibit, and to determine why not all of them are carried over into the structural content of perception. This is hereby submitted as a question for the student to answer. We now turn to motor attunement and meaning.

144. It will be recalled that the motor end of the neural arc was mentioned as a very important functioner of sensation. Indeed, unless the whole arc is active, the focalities of consciousness do not transpire. Although there are several ways in which the full neural release may occur, the most obvious way is to be elaborated in the case of the instincts and the emotions, where the reflex excitation is practically total for the whole organism. Another form of release is the bare maintenance of the arc in a state of low resistance to a low current, as in

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cases of adaptation, when no obviously visible change in the motor aspect comes with continued functioning. Other forms of the motor aspect of release are convergence and accommodation. The continued maintenance of bodily positions with regard to the stimulus is, likewise, just as motor as was the initiation of such motor relations; and, likewise, just as motor as is the inhibition of unequilibrating tendencies from other motor complexes which might supplant them upon the slightest provocation. But by far the most significant sets of motor responses are those, which, either following accommodation, following convergence, or following the inhibition of spreads and wiltings, lead to the further orientation of the organism in reference to its surroundings. It follows upon this that the stimuli are functioned in a pattern on the basis of which we may deal furtheringly with the pliable part of the environment. In such cases, also, the more closely related the exciting stimulus is to the chief furthering element in the environment, the more automatically does the chain of reflexes run off, and the less focal does anything but the end effect to be reached, become. Now the body is an organism, and as such is an example of parts functioning a whole. Likewise, the environment is

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at times organized into a definite whole leading to some general effect into which the effects of the separate parts, for a time, to be submerged. The motor adjustment to an environment then will be a furthering one, just to the extent that the cue-sensation and the resultant motor response are co-ordinated with the possibilities of the developing environment. Otherwise, less than the low current required in adaptation and habit will be developed in the responsive organism. For habit is first based on the ease with which a response is shot off, and second, upon the lack of focality plus the gain in frictionless orientation which the completed response entails. With mannerisms and unconsciously learned responses the chapter on the emotional complex will have to do. From the internal sensations as well as from the general tonic reflexes of the body we gain a momentum which is indisputably fundamental for the superstructure of learned habits, perceptions of relation, and the more special extero-ceptive sensibilities. The motor attunement developed as we approach maturity is always guaranteed, though not always directed, by the residual environment and funded responses within the body. The general character of this bodily momentum is not introspectable,—it is physiological, and

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unconscious. The environment which the unconscious responses function, being largely unobservable, is not what one ordinarily means by his special environment, for this latter is usually unsteady, and by virtue of its shifts in and out of focality, has sometimes erroneously been called that environment in reference to which one is *free*. "I can look or not," "I can close my ears to it," "I can take it or leave it," are expressions not referred to the vegetative system, but to the focally sensorial environment of our organism. But whatever this may ultimately turn out to mean, one can never say that he is unresponsive to his surroundings, even though the sensorial environment is often made up of series which have many missing members,—a thing which partly accounts for the notion of freedom; while the perceptual content,—the environment of logical structure, of learning, of observable furtherances, and the like,—is much more continuous. And in this case it is often a matter of observation that the so-called "freedom of choice" is due to the forgetting of the steps which lead to the present responses.

145. Meanings are implicit in any definable pattern of response. In psychology, at least, anything means what one *perceives it to be*, as well as *what one is about to do* in the presence

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of it. Environmental pattern and motor pattern,—besides these two there is nothing to be said at the start. Meaning for logic is equivalence. When an author writes, "That is to say," or "I mean by this," he always gives an equivalent expression, to get his idea into those consciousnesses which may be somewhat oblique to his own,—his own having been satisfied by his first expression. Psychologically, this would be a case of the substitution of stimulus, and a recognition not only of the latent-period of perception in others, but also of the lack of any psychological congruence between his vocabulary and that of his readers. Again, when a sound is heard in the dead of night and some say "mouse," while others say "burglar," there is no equivalence in anything but the probability of either, and in the sensorial partial equivalence of both. On the other hand, when one says, "I mean that it shall take place," the strictest psychological interpretation of this statement becomes, "focally no inhibitions are causing my predictions to lose their pattern." But in either case there is motor readiness,—the urgency attendant upon a meaningful perception.

146. This brings us to what we call pre-perceptions. The learned readiness to take one ele-

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ment of the stimulus for the whole, (the motor discharging upon any complex situation in terms of one of the specific elements), marks the so-called "intelligent" man, as distinguished from the imbecile. Stupidity is a complex of interminable latent-period and motor incoordination. In such a case the chain reflexes lack automaticity, and the cue-stimulations have so many common parts that they fail to arouse any definite pattern of activity upon the environment. This pre-perception or apperception, as it has been equivocally called, is not the same as the introspection upon what one is about to do. When a motor response has been nipped in the bud, or inhibited, and one is asked to report upon what he would have done, had not such interruption prevented, the report as given need not be taken as equivalent to what is uniformly the case when no nipping occurs. For the report arises out of congested consciousness,—a thing quite different from freely functioned reactions. Of course, the introspection in such a case may be valuable *in that it defines the introspection*, for often by its means one can tell how unified is the personality from whom it proceeds. The difficulty with introspection in such a case is that it makes focal certain elements which normally would never become so,

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and as such subverts the elements involved. That which is brewed in introspection is usually only the unimportant non-focal material becoming focal, *plus* the grammatical effluvia incident to the symbolization of the former contents and processes by means of speech. Introspection is not only reduplicated consciousness, but it manifests characteristics which the original consciousness did not properly have. Pre-perception is potential consciousness, but pre-perception as reported in introspection may not be at all the same as it might have been. And the way to test the validity of pre-perception is by check experiments in the laboratory, or by outside reference to the verbosity of the subject.

Now potential consciousness is indefinable except in terms of what does actually happen without the interruption of introspection. Can this be told by speech? Evidently not. Introspection may now and then get a few of the overtones of consciousness, but introspection is a reversal of the general current of its data, and as such, is valuable for that sort of reversed data and none other. I neglect and disparage the word "apperception" because it is a term which implies that we make up our perceptions out of tag-rag sensations by adding to them from a "mental" storehouse. Things are summed and

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get additional properties thereby, not out of a hypothetical "mental" storehouse, but by virtue of the interaction of the neural currents to function an interacting environment. The old idea of the soul being something that thinks and thereby adjudicates sensory content has been evaporated to its last whiff, and with it has gone every notion of dualism and duplicity, for these two are indeed twins.

147. Along with pre-perception comes pre-sensation. This is one of the cardinal items in memory. When, for example, upon the mere mention of the name of an object we obtain sensory contents of it, we are said to remember or to have pre-sensations of it. This comes about by virtue of the fact that we have gained identical responses to the various elements in the object, so that its color, shape, name, and so on, are all functionable by the same response. Now, the qualities and properties of objects have no more rigidly defined geographical position than have their names, and pre-sensation is but a case of obtaining part of an object in sensory content from the motor response to that which for us is the "open sesame" to such content.

148. With a brief consideration of the nature of speech, this long chapter must close. So far as evidences are to be trusted, speech can

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be traced evolutionally to cries of danger, cooings and purrings in the mating season, wailings, cacchinations and "burbblings." Speech arose apparently from the needs of communication, but seems also to be a derivative of self-amusement as well. From the first wild cries of savage life,—whether from anger, fear, affection or other situations,—we have derived the potent elements of speech, these, later on, being added to out of the need of orientation to a more complex and tranquil environment. Part of language is onomatopoetic, that is, the words are direct imitations of the sounds of the things referred to. The rest is quite arbitrary and conventional. The vowel element in language appears to be more directly related to the primitive order of things than does the consonantal element; for in every situation in which language is used forcibly and emotionally, the pitch element takes precedence over all else, and with vowels alone these nuances of pitch are functionable.

149. Language is also geographical rather than hereditary. A child of Chinese parents, brought up from the beginning in the midst of people of a different nationality, will speak only the language of its foster parents. This is not accounted for by the shape of the mouth cavity,

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even though the palatal arch of different peoples is of different height and form; but it is due to the extreme flexibility of the movable parts of the vocal apparatus. These are the tongue, the lips, the lower jaw, and the muscles of the throat. The extremely important socially organizing part language has played in history is attested both by the social amalgamation of races having a common language, and the political unions of people of a common tongue. But, over against this fact is the anciently reported historical event of a conquering people making the language of the conquered the polite language of their court. In these cases, however, the absorption of culture has gone hand in hand with the passion for knowing the language in which such culture was developed.

150. Language is also a reaction. To mention the name of something seen, heard or handled, is to deal with it twice; and such dealing involves different elements of consciousness, and consequently differing effects. Furthermore, the voice, by virtue of its being produced in the head, has an advantage over other reactions in several ways. In the first place, the reaction to auditory stimuli is quicker than to almost any other kind. Furthermore, the dominance which the head plays in personality, as

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well as the fact that the face is far and away the focus of all social intercourse, makes the language of a person his *pièce de resistance* in a majority of social matters. When one considers how largely information comes by way of words, the place that words have in human affairs seems clearly the chiefest. Language, as a reaction, is thus a doubling of responses to the situations in which it is used. Very little of it is absolutely necessary, for most discussions end with the definitions of the terms first employed, and concerning which so many misunderstood statements were made. For words, as symbols, are not bound to follow the orders of the things symbolized, and as a result, evaporation of meaning frequently occurs. But it is undeniable that relations and functions could not have been mutually considered without their aid.

151. The order in which a child learns a language is curious. Contrary to the report of fond parents, the imitation by a child of the sounds and mouth movements of its parents is not flattering to the famous intelligence of the human race. The child responds to the stimuli of its teacher by the best way it can, but hard consonants, such as 'k,' 'f,' 't,' and the like are imitated by the use of their softer forms, 'g,' 'v,' and 'd.' Furthermore, it learns class names

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or general terms, before it learns words of selective discrimination. It speaks of itself in the third person before it uses the pronoun I, for to all intents and purposes, it is thoroughly realistic in its absorption of all data.

152. Nevertheless, the importance of language does not lie in the factors of its origin. Language, as a quotidian commodity, gets used in certain ways not to be explained by reference to its source. Words slip their moorings and exhibit common parts whose existence was little suspected beforehand; besides, the perception of new relations in things does not always go with the invention of a new word,—instead, we put together the old ones and make them do a little longer. In fact, all the new words are either derived from dead languages, or are blurted out unexpectedly in slang and banter. These developments are not introspectable either. We speak by momentum, and mostly out of the co-conscious, when speaking in our normal speed and confidence. In this point, language is exceptionally typical of all unhindered consciousness: to function speech and then to recall it is the same sort of manifestation as seeing, hearing and the like, and then introspecting upon it. The alterations that occur to us in point of what we would have better

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said, is the same sort of consciousness as the introspective consciousness. For neither is speech ordinarily correlated with the chronogenetic order of our ideas, nor is it the same as later corrections of it would indicate to have been our exact meaning. It has, however, common parts with both. The later correction indicates logical determinations, while its lack of correspondence with the play of ideas illustrates that things can get into another than the first order of cross-sectioning.

153. Now an idea is either an attribute of a thing, a part of a whole, the pattern of a thing or a part, or the terminus of such a pattern, functionally construed, and so on. Ideas are anything being functioned by a nervous system. Functioning is the same here as knowing, and the only reason we distinguish between things not yet known and things known at the present time, is because the stages of their being first functioned, spoken of, and logically ordered, reveal in this order relations which through summation and fusion have been overlooked. We use the term idea also to indicate usually that some such development is in progress, rather than that bare noticing is all that is being done. The language reaction helps significantly here, for by means of it we are en-

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abled to select more elements for retention than otherwise, and to respond specifically to things to which speechless animals cannot be discovered to be at all tropistic. Consequently, the more accurately language is used, the more things can be enumerated, the more patterns and relations can be specified and filed away, and the more comparing of ideas can be accomplished. Following this, the business of argument reorders the data and reveals coincidences and contradictions. We thus obtain considerable positive information by the interplay of language, quite apart from the physical presence of the data to which it refers. It is due to the fact that language, apart from the things, may reveal relations not before noticed in the things themselves, that we have developed the notion of ideas *of* things. For ideas, in that they are attributes *of*, parts *of*, plans *of*, and the like, imply on this account no duality between thought and thing. Insofar as they are turned into words,—auditory symbols,—they seem on this account to necessitate a cleft between matters of another sense than that of sound, as, for instance, when we *mention* tastes and sights, and then, by momentum and preponderance, to cover the whole of consciousness with this sort of debilitating predicate. Unless

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“consciousness of” means that there are several orders in the cross-section into which things can get, it has no meaning; for besides this and selective response, nothing is fundamental upon which it can be based.

154. The parts of speech, actually disregarded except in grammars, are significant for this treatment. Nouns are language-equivalents of things, principally, as well as of parts, and frequently of orders and patterns. But orders are equivalent to verbs whenever there is functional significance in them. Also, genetically, nouns refer to sensation masses, while verbs refer to motor intention. Attributes of “things” are primarily adjectives, while the functional elements of “wholes” and “things” are adverbial. The noun is thus either made of adjectives, or made of verbs and other parts of speech. Relations are expressed by the use of prepositions, conjunctions, and verbs, while sudden inhibitions are functioned by the interjections. Of all the parts of speech, the personal pronoun is the latest in development. Its mercurial character is a matter of even common notice, for besides referring to the cross-section equivocally for different spaces of time, it refers either to a very insignificant part of consciousness one moment, or to the dominant motive at

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another. The intentional suppression of ideas, commonly called lying, is thus made exceedingly easy, for the pronoun I is a shifting center of reference at best, and all that is said *about* it must be said in terms of the elements contributing to it as a center. Being guaranteed by its periphery, and not being something subtle and within, the pronoun I and what it means must always be omitted when the accuracy and truth of a matter is at stake. The reader is at liberty to indulge in all the implications in the above statements.

155. Language when printed, as in this present form, is to be distinguished from the utterances of steady speech. For if one wishes to be read, he must seek to present his words in such a form that as many common parts will be present as there are persons for whom the utterances are to be stimuli. And while concessions are always made, they are not to be thought of as concessions which betray the author of a book into compromises. To be able to get a hearing on account of using motor terms, well-chosen illustrations, and the like, is not the same as sneaking up behind a person and making him consent before he is aware of what the drift of the matter is. Seldom is the flow of any person's ideas good enough to speak

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or print without castigation and reordering, neither is any hard and fast plan in composition ever strictly adhered to. Likewise, in speech and writing we respond to the environment of the audience and the environment of the subject matter, and seek to find and express common parts in both environments, so that as many as we wish to stimulate may be shown the object, and have their threshold lowered by removing the inhibiting inessentials. In the plan of a book, however, there need be no concessions. The logical order of presentation is not either linguistic nor individual.

156. Sensation and perception in the conscious cross-section are thus seen to be items whose structural differences are chiefest. We shall now turn to another set of responses in which we shall not find structure central, but rather disorganization, due to continual inhibition, fusion and confusion. I refer to the emotions and the instincts. To a large degree, also, we shall have to consider consciousness laterally and developmentally in order to understand the status of any emotion in the cross-section. As it is, moreover, this book is but an outline, and sketches, rather than fills in, the patterns it employs in passing. But it makes no attempt to explain away anything that *is*, unless, per-

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chance, it be certain beliefs in non-existent things, and this is not only within its province to do, but also its particular business not to leave undone.

Bibliography

I. General.

Holt, E. B., "The Concept of Consciousness," especially Chapter XI, "Sensation and Perception in the Conscious Cross-Section," and Chapter XV, "The Emancipation of Physiology from Philosophy."

Sherrington, C. S., "The Integrative Action of the Nervous System," Lectures I to VII.

II. Touch.

Rivers, W. H. R., and Head, Henry, "A Human Experiment in Nerve Division," in "Brain," November, 1908.

Titchener, E. B., "A Text-Book of Psychology," especially pp. 143-159.

Myers, C. S., "A Text-Book of Experimental Psychology," Chapters II and XVII.

III. Smell and Taste.

Titchener, E. B., op. cit. pp. 114-141.

Myers, C. S., op. cit. Chapter VIII.

IV. Kinaesthetic Senses.

Titchener, E. B., op. cit. pp. 160-182.

Myers, C. S., op. cit. Chapters V and XVI.

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V. Hearing.

Titchener, E. B., op. cit. pp. 93-112.

Myers, C. S., op. cit. Chapters III and IV.

Mach, E., op. cit. "Sensations of Tone."

VI. Vision.

Titchener, E. B., op. cit. pp. 59-92.

Myers, C. S., Chapters VI and VII.

VII. Space Perceptions.

Titchener, E. B., op. cit. pp. 303-373.

Myers, C. S., op. cit. Chapters XVIII to XXIII.

Pierce, A. H., "Studies in Auditory and Visual Space Perception."

James, W., "Psychology, Briefer Course," Chapters XV, XVII, XX and XXI.

Mach, E., op. cit. pp. 41-118.

Holt, E. B., "The Place of Illusory Experience in a Realistic World," in the "New Realism."

CHAPTER IV.

THE EMOTIONAL COMPLEX

1. This chapter will consider emotions, instincts, and their derivatives. Strictly defined, both instincts and emotions are motor responses to disordered situations. Their stimuli are objects consisting of series, many of whose terms are missing. Thus mal-adjustment of the organism, and a disordered object are the functional and content sides of emotions and instincts.

2. Responses define environments, and thus the emotional reaction may be functioned by one organism in a situation which arouses no such reaction in *another* organism. On the other hand, a disorderly environment may be flanked on all sides by an orderly one, and so arouse various types of orderly or disorderly reactions on the part of organisms confronting it, with the result that the ensuing motor discharges, and not the nameable sensory content, must often be taken as the criteria of "what the organism is doing." Environments alter and organisms change, and the steps by which these alterations and changes occur need not be ordinally correlated. So that the mal-adjustment

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of the organism to the situation is one, but not the only disturbing factor in emotional and instinctive action. Nevertheless, the usual effect of such mal-adjustment is cumulative,—it increases the disorder. The fusion we met with in sensation is antityped here in *confusion*, attended by the instant arousal of general skeletal reaction and glandular secretion, usually resulting in entire translation of the whole body through space. Instinct is as sudden as reflex, and emotion as positionless as feeling-tone, and both instincts and emotions lack that element in perception known as pattern. They both arise in situations we are unable to grasp significantly, and consist of the suddenest and strongest outgoings of energy of which we are capable. They follow a complete chopping off of former focal consciousness and, instead of leading to further activities of profitable orientation, lead, unless brought to a close by exhaustion or mutual inhibition, to a situation of tatterdemalion consciousness.

3. The term “emotional complex” is used to indicate that these reactions usually keep crowding, impelling, or inhibiting each other. Furthermore, they often get insufficiently shot-off, and as a result become suppressed,—the unshot residue smouldering away as an uncon-

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scious readiness of neural response. The unconscious has no content, but it constituted solely of functions, and it is this condition which renders obscure the causes of the breaking loose of smothered emotions. When a form of consciousness has no content, it cannot be satisfactorily described by the use of nouns. Verbs and adverbs are alone to be used. This is even witnessed by the fact of the current terms for the emotions and instincts: fear, flight, pugnacity, wonder,—such terms are all basically verbs, and only made over into nouns to satisfy the pragmatic urgencies of speech. There is no object, fear; there are only persons fearing: nothing is flight; there are only legs animatedly decreasing the parallax angle in the eyes of the observer. This is not to be taken, however, to mean that fears and anxieties, for example, are groundless. It means nothing of the sort. But in every case of emotion or instinct, one is functioning a content less definable than one finds to be the case with sensation or perception. And just as one has a red sensation or a logical perception, so in the case of these disordered responses now being considered, one has a fearful or a pugnacious consciousness, and this consciousness always has an object.

4. Emotions and instincts, then, are the

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names chiefly applied to the functional aspect of disorderly consciousness. The content of such consciousness may be composed of *any* objects whatsoever. Thus we may be afraid of a green, a black, a tall, a hollow, or a scurrying object, each of which are yet green, black, or tall, etc., exclusive of their emotional status. We are emotional or instinctive toward anything at all. And it is on account of the lack of specific arousers of these mal-adjustments that we have no terms which specifically differentiate the environment into special contents for this and that emotion or instinct. Our strictest definition in this case will therefore concern the neural discharges incident to their appearance. Two main points are profitably noted here. The first of these is the phenomenon of irradiation of the generating impulse which arouses centers of functionation not normally stimulated by the object of emotion or instinct when it is in another environment. The second point is what is called the auto-catalytic character of neural release. The first of these,—irradiation,—is not exclusively a phenomenon of the neurology of instincts and emotions. We spoke of it in the first few pages of the last chapter as significant even for the simpler responses. Synaesthesia has also been defined as correlated with it. Like-

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wise, pre-perception and pre-sensation are irradiation phenomena as well. What then, shall we say is idiomatic in the irradiation aspect of the mal-adjustment phenomena? Why, this: that the irradiation is of such a type as to arouse non-perceptual (i. e., non-stabilizing) reflexes of the chain type. Thus it is that the aspect of the total situation confronting the organism is inseparable from a full account of the responses generating the cross-section.

5. Now for the second,—the auto-catalytic character of the neural releases. Auto-catalysis occurs when one of the *products* of a reaction acts as a catalyser, catalysers being those things (substances) which hasten reactions by their mere presence, without entering into the formula themselves. The *friction* of the match sets free the chemical energy of the powder in the magazine, but the friction is not an element in the formula. Again, the decomposition of hydrogen peroxide by platinum black is a case of catalytic action. From the best evidence we have today, it is safe to assert that neuronie release is a type of catalytic action, especially in the matter of the establishment of settled dispositions in the organism. For upon the very first functioning of a nerve, the nerve path becomes sensitized, the threshold lowered, and

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further stimulation rendered easier. Indeed, this fact might be said to be the neural basis of logical classification, and we might also add that the reception or rejection by the various organs of the body of nutriment and sensory contents is exactly what choice in its lowest terms means. The sensitization of the neural paths is indeed the formation of an asymmetric series. To return to auto-catalysis, the release of reflex energy in the nerve cells is accompanied by the accumulation of deposits that unite to form a veritable storage cell, "which is capable, under appropriate conditions, of being discharged and [thereby] restoring the same specific current by which it was produced." All the neural responses tend, indeed, to become of this general character,—that is, auto-catalysed,—but some paths, being traversed oftener, and more vigorously than others, (while at the same time producing vivid irradiation among their neighbors), get a momentum as well as a prominence in consciousness which the others do not have. Attention is just a clear pathway of perceptual neural response, or release, and is a derivative of acuity, threshold, interest, and other furthering ingredients. Between selective attention and restricted neural momentum

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there is no one so wise as to be able to draw even a hair-sized line.

6. Neural momentum is also the dominant element in habit. Habit, unlike emotion, is usually unintrospectable. Unlike emotion again, it has a definite pattern, and serves, or can be made to serve some other set of responses than its own. Considering habit in general, it is neither useful nor useless; but considering it from the standpoint of psychology, it is the adjustment of the organism to some constant feature in its environment with about the least friction possible. Contrariwise, emotions arise from mal-adjustments to the environment, and in their continuance lead to worse and worse adjustment, for only by exhausting the organism, or by sudden changes of focality do they bring about any possibility of readjustment on an equable basis. Curiously enough, there is a lack of correspondence between neural momentums and the speech reaction they arouse. Neurally construed, greatest ease of function comes when the wonted impulses are traversing the paths; our statements, however, very often assert that we prefer a complete change of activity. At the bottom of this lies the emotional complex, and the presence of emotions is usual-

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ly indicative of some disorder in neural continuity.

7. Now the disordered environment mentioned above is but one of the environments enveloping the organism. When General Wood purified Havana, and by so doing cut down the death rate prodigiously, he was not responding to the disease-making environment so much as he was responding to the scientifically prophylactic environment of bacteriological laboratories. Havana was but a perplexing term in his entire environment for which some reagent was to be supplied in order to neutralize it. The needs of Havana and the visible condition of that city were two terms prime to each other; but by responses to a third element, having chemical common parts with both, he was able to make the Cuban city a member of a series of other cities, a series defined by its high position relative to vital statistics. On the other hand, the Havanese had been responding solely to the disorder. Now, to perceive nothing but a disordered environment is not to perceive in the strictest sense at all; but to perceive a disorder in the midst of a larger order is virtually to function the discrepancy between them. Thereafter the motor readjustment of the discrepancy will take place just as fast and just

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as far as there are common parts between them, and as fast and as far also as there is unification among the perceptions and impulses of the readjustor. There are disordered minds in the presence of what to others appears order and positive pattern, but these minds are still functioning the residues of unshot impulses,—suppressions for which there has been no utilized outlet. In many such cases, the environment is well said to be within the body. It is here also that the doctrine of the soft soul had its source.

8. I take particular umbrage at the conventional treatment of instincts. As in many another case, obscurity of source has been made the basis of the tenacity of belief. For the instincts are generally treated as unlearned, sudden tendencies to action; race habits, “designed to promote the welfare of the race,” and they are furthermore said to be “uncontrolled by intelligence.” Volume after volume has been written on this subject of instinct, and the general treatment indicates that bibliography plays a larger role than does observation and clear insight. Much obscurity results from this method of procedure, for the writers who employ it have their eyes only on the organism, and not on “what the organism is doing” in the midst of its environment. The insufficiency of such treat-

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ment will at once appear if we consider anything more than the organism. Sensations are objects and perceptions are objects, and likewise emotions and instincts cannot be severed from their exciting stimuli and remain in the system of things known as the psychological order. The statement that instincts are unlearned does not signalize them as unique among the events of the cross-section. In the first place, none of the tropisms are premeditated, sedulously tried out, and stamped with the hall-mark before they become settled dispositions. Secondly, suddenness cannot be their distinguishing mark, for short latency is applicable to more of the responses than they. And that all the individual members of a race do this or that is more indicative of gregariousness than of anything subtly *original*. Instinctive action only appears sudden because of the diremption in perceptual consciousness that goes with it, and instinctive actions are racial only in so far as the predicaments of the individuals of a race are identical. A race is a constant function of its environment, a derivative of circumstances, and it is the environment that shapes it. The ubiquity of instincts is no more special than the ubiquity of ears or eyelids. The instincts

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are said to be “designed to promote the welfare of the race,”—an expression which is supposed to possess splendid oratorical possibilities,—but which upon analysis turns out to have no meaning. For instinctive actions, arising from disordered environments, lead to nothing stable until they are superseded by clear perceptions, the latter not being in any necessary way preceded by disorderly functioning. Furthermore, self-preservation is said to be the kernel of every instinct. But upon examination it will appear that this means bodily preservation, not preservation of the self in its developed condition, and so we have to narrow the concept “self” in order to satisfy such a definition.

9. I use the word instinct, then, not because there is any *internal* origin for it save mal-adjustment to the situation met with, neither because it could not be superseded by a more empirical expression, but merely in order to show that a realistic psychology is not obliged to leave anything out of its account of mind. The impossibility of self-observing the instinctive reactions, and the general loss of focal mind which they entail have been the roots of the notion that some special, internal readinesses were basic in each individual. There are response possibilities in each individual, but to call these by

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a name that implies a stage all set ready for the curtain to rise is as reasonable as saying that ordnance is cast with the ammunition inside of it.

10. The truth of the opening thesis of this chapter and its consequent development is witnessed by certain modern cataloguing and explanation of what are still called the "original tendencies." I refer to the work of James and Thorndyke, whose lists of "instincts" are so broad as to be subversive of the general idea underlying their construction. James' account may be found in his "Principles of Psychology," Vol. II., Chapter XXIV., while Thorndyke's is given in his "Educational Psychology," Vol. I. Now the exact difficulty in these treatments is that when they were written, the Ego-complex was not so much as even heard of,—at least not assimilated by the writers of these treatises. The infant had been regarded as "trailing clouds of glory" for about five years and three months, and then as suddenly becoming sheared of his nimbus and mortgaged as are the rest of us with inhibitions and a tough environment. But the Ego-complex, or the evolution of personality, has been traced quite a ways into the nimbus, and psychology now includes the study of cradles and cognate apparatus. With this

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change, moreover, there has come the recognition of the futility of regarding the so-called "instincts" as universals, or unlearned tendencies at all, and we are slowly coming to recognize that the environment begins to be specifically functioned with the first breath, and not after an indeterminate and subtle interval. On the basis of this, then, I make bold to define the instincts and emotions as mal-adjustments, and to select from the list of generally given original tendencies those which fall rightly under this category. The boldness of the venture is appreciated, and so finality of conviction rests upon its accustomed supports.

11. The most modern treatment of instincts and emotions appears in McDougall's "Social Psychology," and I shall quote his list in the order in which the terms follow the greatest-to-least condition of mal-adjustment of the organism to its environment. As follows:

<i>Instinct.</i>	<i>Emotion.</i>
Flight	Fear
Pugnacity	Anger
Repulsion	Disgust
Curiosity	Wonder
Self Display	Positive Self-feeling
Self Abasement	Negative Self-feeling
Parental Instinct	Tender Emotion

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Reproduction	No one specific emotionality
Gregariousness	*Fear of solitude
Acquisition	*Various self-feelings and jealousies

(The terms marked (*) are not found in McDougall.)

The instincts and emotions appear usually together, the former being detected by the movements of the skeleton; the latter, by the amount of vascular disturbance summing into confusion and glandular secretion. Furthermore, Sympathy, Suggestion and Imitation are enumerated, as well as Play. There is also a list of complexes of emotions both involving and not involving the existence of sentiments, these latter being an organized system of emotions about some object.

12. Let it now be understood, however, that these various manifestations enumerated in the above table are capable of many degrees of intensity, and when they lose their edge, are not classifiable among the seriously disturbing maladjustments. Particularly note the instinct of *curiosity*. When this appears alone, as it may, without *wonder*, it is often linked with interest and attention in such a way as to lose its non-perceptual character. Gregariousness, when

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adapted, may also become a matter of very little disturbance, if the environment of other human beings is quiescent and in order. Similarly, acquisition may become bare thrift, and as such be pacific in its motivation. The others, however, are not so readily soothed into furtherances, as a little observation will readily show. This, however, as a last word here; that when the instinct *and* its attendant emotion occur together, they are more likely to be disorderly responses than otherwise, and some of these pairs of responses cannot be adapted nor made subservient to dominant, furthering purposes.

13. Somewhat in detail, then, let us consider the above pairs of responses together. One cannot always use self-observation as a basis for studying them, for accurate self-observation is only attained by considerable study; and to ask some one how he feels when he is afraid is to ask but for summation and fusion, rather than for a detailed analysis of the facts. *Flight-fear* occurs as early as any of the complexes of the list, and much has been written on it that is well worth reading. James' account in his "Principles of Psychology," Darwin's "The Expression of the Emotions in Man and the Animals," are typical of the best in this line that is

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extant. Perhaps no other emotional complex than flight-fear involves such a shattering of focal continuities in consciousness. The result of it is a general super-violent efferent discharge, resulting in either paralysis, or in the swift projection of the whole body by running as far from the stimulus as possible. But the self-protective character of this is only on the assumption that the deep sea and the devil are both in front of one, and that to run in the opposite direction is to obtain sanctuary. The running away, of course, is no guarantee of the perception of safety at the terminus of flight, but the general utility of it lies in a fifty-fifty chance of stopping somewhere this side of the devil. Children are not afraid of everything strange, but principally of noises and situations intended to upset them. Of lightning they are often unaccountably afraid; but of thunder, and of dark closets and bugaboos only in proportion as their parents threaten them by voice or attitude before introducing them to the stimulus. The parent is as much a part of the child's environment as are the furniture and milk bottles, and the part the parents play is too frequently and in ignorance excluded from an account of the child's reaction to the stimulus. Besides, I have been told by military men with

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medals that much of the rashness of bravery is plain ordinary fear,—the soldier being in a predicament, and one thing to him about as good as another. Now, by virtue of ideas having common parts with things, and by virtue of the fact that wholes can be vicariously functioned for by their parts, the emotions can be aroused by the presentation of any part of the originally exciting stimulus, provided it is bolstered up by effective helps. Most of our functioning anyway is due to the serial focality of the barest common parts.

14. The *pugnacity-anger* complex arises clearly in situations which are too much for us to manage, and starts, at least, a series of events whose other end is often the annihilation or humiliation of the object or person confronting us. Many authors regard the distortion of the lips during anger as a remnant of the animal habit of frightening one's prey by the sight of the teeth about to bite. At any rate, pugnacity differs from flight in the direction of bodily translation, and in anger we are conscious of our bodies as larger than we are in fear. Professor Cannon has done significant experimentation upon both of these complexes in point of their physiological concomitants. In the first place, he finds the peaceful tabby cat of a bet-

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ter digestion than her cantankerous mate, as evidenced by the fact that "fear and anger.... are attended....by cessation of the contractions of the stomach and intestines." Furthermore, the disturbances of digestion which outlast emotional excitement, (after-image), are correlated with the action of the ductless glands which secrete adrenalin, a substance which, when circulated in the blood, causes glycosuria and other significant disorders. "It seems to act as an antidote to muscular fatigue, and renders more rapid the coagulation of blood." Both of these concern the pugnacity-anger complex, as well as that of flight-fear; for the angry or fearful person often performs acts which seem fully beyond his normal strength. Likewise, our disregard of wounds and their sudden healing in many cases of violent emotion are accounted for. (See "Recent Studies of Bodily Effects of Fear, Rage and Pain" by W. B. Cannon, Jour. Phil., Psych., and Sci. Meth., March 12, 1914.)

15. *Repulsion* and *disgust* are more chemical than anything else. Certain bitter tastes and nauseating smells are both noxious and originally annoying. The sense environment in which they figure is out of balance, and mal-adjustment at once supervenes. The first functioning to this sort of an environment is strictly

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chemical in its character; later on, by analogy, these responses can be obtained in connection with a set of stimuli which are not primarily chemical at all. Sneers, scorns, and loathing, which we direct at persons rather than at chemicals, are responses to disordered situations made on the basis of verbal common parts. Of course there are the unwashed and unscented to whom we respond chemically, but for a *book* to be loathsome, an analogical situation must supersede. Certain very expensive books are printed on a most ill-smelling paper, and yet the response is to the printing and other beauty about the book,—the publisher having betted on the long latent-period of the odor, and the inhibitory properties of the literature.

16. The *curiosity-wonder* complex is less disturbing than the two previously mentioned, and is the basis of the questions what, how, and why. But science only begins in wondering why; it ends in finding out. And after this is done, no mal-adjustment is present. Wonder as an element in philosophy is of the same character, and only mystics keep on wondering after they have gotten under the top crust of things. To say that the instincts are the springs of human action is but to speak half of the truth. They are not the *regulators* of human

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action, for these are perceptions instead. The curiosity-wonder complex differs from the two others thus far discussed in that it involves sensory elements rather than motor, and so does not function the shearing off of focality as is the case with the more vigorous complexes. But that the object wondered at is in a series too prime for orientation, none will be able to deny.

17. *Self-display* and *self-abasement*, with their attendant emotions of positive and negative self-feelings, are responses to social disturbances of an intricate character. They are inevitably related to shyness, bashfulness, modesty, vanity and other so-called psychological simples, involving certain sexual elements of which some mention must be made. Exhibition is a cardinal feature of the mating season of all creatures, and displays and abasements are used to increase mutual desire. When the exhibition complex outlasts the specific incident in which it arose, or becomes suppressed, as is often the case, it may crop out in very unusual situations. Thus the blushing reflex and the "sidelong glance" are suppressions being partly released. This is not to say that manifestation of an impulse goes necessarily with focality of the knowledge of its origin, for in regard to most of

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our nature we are naively ignorant. The old Socratic maxim "know thyself" has recently been inverted into "knowing oneself is a function of knowing others." Thus an item in consciousness of a sexual origin may not be accompanied by the focality of the desire for reproductive relations with another of the species, although we may be able to show that normally such would be the case were no inhibiting perceptions present. The reproductive instinct is devoid of any specific emotionality,—it being usually a periodic function of certain glandular motivation, and only embellished by emotions in certain concrete situations. The disorderly element in this instinct is the fact of, what might be called upon analysis, its promiscuous character. The insecurity attendant upon this condition leads to the above-mentioned emotional embellishments of display and abasement. Self display and self abasement also originate in an environment where the truth is suppressed, and reappear quickly whenever analogous situations occur. Thus the general adornment of the body, as well as the humility of a pensioner, may be entirely asexual, but the adornment and humility are both calculated to affect favorably the one at whom they are directed, and

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as such are forms of those suppressed ideas known as lying.

18. The *parental instinct*, with its attendant emotion of tenderness, is a function of the helplessness of the young over which the parent becomes solicitous. The child's self help cannot be forced,—it must be slowly developed, and slowly strengthened. The realization of the discrepancy between its present condition and that of mature development, as well as the necessity to do nothing but wait until such self help matures, constitute the disorder in the situation evoking this form of response. Not unfrequently is the parental instinct manifested as a form of scepticism, which is a selective response to the abstract disorder of the cosmos. Again, the background of tender emotion may become studded with all sorts of violent emotions. The extremes to which all creatures go in order to defend their young, the chastisement which sometimes gets meted out to children upon the most trivial occasions, and the alternations of imperiousness and fawning which parents bestow upon their offspring, illustrate the point. Under the spell of the tender emotion, perceptual distortion is the rule; the "cute" acts of one's own children may at the same time be equivalent to vandalism, and a "prank"

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in one environment may be an evidence of concealed misanthropy in another. Later on, the confidence in the superiority of one's own children,—on account of parental joy in being a cause,—is the basis of the plebian dogma that no one is quite good enough to mate with them. All these events are mal-adjustments, and the nearsightedness which must go with such instinctive and emotional reactions appears to be incurable if treated strictly within its own terms.

19. *Gregariousness* is the social instinct *par excellence*. Only the few are hermits, the rest of us are beholders and beholden all the while to the rest of society. Perhaps no other instinct could be gotten along so poorly without, and yet no other instinct demands as its tax so much equilibration to render it harmless. Indeed, the virtues, so-called, are the taxes we have to pay for gregariousness. It arises out of the fear of solitude, the uneasiness we feel at being absent from our fellows. But I take it that it is not bound up with any affection for our fellows, for we do not necessarily *like* those with whom we prefer to be. The main discomfort of solitude comes through the realization of unfilled spaces between our body and those of others. Cities, states, clubs, fraternities,

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churches, and all other organizations are primarily social aggregations for the annihilation of solitude. Solitary confinement in prison is the rational psychological limit of punishment, since we are not so constituted as to systematically punish a man by utter "cold shoulder." Were such the case, doubtless the person so rejected would immediately put himself off. The jokes about bachelors and old maids are concealed scorn at a lack of gregariousness, regardless of how dismal a predicament many of the "unclaimed blessings" so discriminated against, have escaped. This instinct, however, does not in any way guarantee that the satisfying person shall be met by the mere fact of there being other bodies in the vicinity, and as such it represents again the general principles of disorder and absence of clear perception.

20. It is hard to draw the line between the *play* motive and the instinct of *acquisition*. We saw in the former chapter, that the movements of the stomach were gone through with regardless of the presence of nutriment in that organ. Thus it is in many another situation with regard to the human body,—*series*, rather than *reasons* are the ultimate bases of situations. In play and acquisitiveness we find basic certain odd fumbings, manipulations, gatherings and

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scatterings, apparently from an excess of energies, though not a surfeit of them. Certain motions can be gone through with at a low expenditure of energy without the slightest degree of exhaustion ensuing. Acquisition also arises out of fumbling, but the resulting consciousness,—predominantly motor,—of having things in a certain spacial and motor relation to the body, produces further stimulations to the same end, and we keep gathering rather than throwing away. When such occurs, we have a case of perception. For the word “mine” principally means “that thing frequently responded to.” Furthermore, thinking about the things we have so responded to is auto-catalytic in its character. At the basis of miserliness and wealth lies this instinct of acquisition,—both differing solely in the co-presence of the instinct of self display. But there is no evidence for believing that there is an intention behind this response,—those forever planning to become rich, rarely becoming so. On the other hand, let Socrates come up and ask the possessor of wealth why, or to what end he is accumulating, and he cannot for the life of him tell. No reason given is exclusively in the field of inquiry. In this connection one will observe that the instincts are not characterized by any specific, nameable

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content. Hoarding and jealousy may become co-functioned, but hoarding and generosity may also appear together. The successful business man may dislike the whole scheme of his endeavors, or the unsuccessful one be of the opinion that his plans cannot fail. In all such cases, the non-focality to the person himself of his ruling manifestation is indicative of the general principle of disorder as the basis of instinct.

21. *Constructiveness* is frequently named among the instincts, but for our purposes only the random fumbling of objects preparatory to the possible ordering of them on the basis of perceptions, could be called by any such name as "original tendency." Furthermore, fumbling is typical of mal-adjustment, and appears to have no specific, attendant emotion. Psychologists have never admitted that *destructiveness* is as "original" as is constructiveness, for they have steadfastly overlooked the fact that young children maltreat and destroy long before they ever build or construct. Constructiveness and destructiveness might be profitably treated of together, even if but for the differences they show which are not manifest in the spelling of the words. For the first of these lacks those anger elements which the second possesses. Random fumbling, again, may be suddenly su-

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perseded by the perception of order, and thus be brought to some sort of furthering conclusion; while destructiveness meets all orderly situations only to disregard their perceptual elements, and to reduce them to disorder. Once more, certain successful achieving of a pattern is frequently followed by the loss of that pattern, and so the orderly and disorderly series may alternate with considerable frequency. Only in point of its intermittent clumsiness, then, do we call construction an instinct, for when a dominant pattern is attained and steadily functioned, the environment becomes stable, and the responses non-contradictory. On the other hand, destructiveness is functioned by a strabismic consciousness, that is to say, a cross-section in which many un-shot complexes are smouldering, whose functioning is anti-social in its tendency. Vandalism, the joy of producing carnage, the antique postulate of a trans-temporal oven in which those not holding views tangent to our own were to be eventually kept at n degrees Centigrade,—such are common examples of this response to internal disorder with its attending manifestations. Even to see one building torn down to replace another causes some orderly minds to avoid the sight, as well as to feel resentment at the act. And

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there is perhaps validity in the legal status of those who butcher for an occupation, in that they are excluded from certain jury service on the basis of lacking perceptions of the orderly status of an organism amongst its kind.

22. Three other forms of complexes may suitably be presented here. These are *suggestion*, *sympathy*, and *imitation*. The first has to do with the inducing of a non-perceiving consciousness to function the ideas of another when put into words calculated to appeal to his instincts or emotions; and also to formulate prematurely his motor functioning on that basis. Sympathy is the appeal to, or sharing of, the surface emotions of another, with or without attempting to stir up the background of suppressed and smouldering complexes. Imitation is either copying the motor responses of another, especially gross movements, or copying the effects produced by another,—all such copying being virtual in its identity rather than factual. No resident benefit lies in any of these three, considered as bare descriptions of what happens in cases where they are exhibited. Nevertheless they can be made subservient to almost any purpose promulgated, and this is of large account in the educational world, as well

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as in advertising and selling, and the general business of social organization.

23. McDougall's enumeration of the complexes of emotions falls into two groups. The first one does not necessarily imply the existence of *sentiments*, while the second one does. "Sentiment" is taken to mean "an organized system of emotional tendencies centered about some object." In the first group there are the following emotional complexes.

(a) *Admiration*. This is a compound of wonder and negative self-feeling. (By compound is meant a simultaneous occurrence, sometimes in the form of partial fusion, sometimes not.)

(b) *Awe*. This is composed of admiration and fear.

(c) *Reverence*. This is derived from a blend of awe and gratitude, both of the elements of awe being clearly present.

(d) *Gratitude*. This is composed of the tender emotion and negative self-feeling.

(e) *Scorn*. A mixture of awe and disgust.

(f) *Contempt*. Composed of scorn and positive self-feeling.

(g) *Loathing*. A compound of fear and disgust.

(h) *Horror* is the acme of loathing.

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(i) *Fascination*. This is a mixture of loathing and wonder, fairly well balanced.

(j) *Hate* is composed of anger, fear and disgust, while

(k) *Envy* is derived from negative self-feeling and anger. It must be kept focal that the binary and tertiary character of these compounds is incapable of any such clear exhibition or demonstration as is possible with sensations and perceptions. And the "organized" character of them is little more than bare "withness." Structure they lack, and are thus responses to situations involving disorder. But by virtue of possessing among themselves common parts, or common functions, the transition from one to the other is readily made in the presence of the same exciting object. All it requires is that the object be in mal-adjustment,—the train of these complexes is then easy to follow. As a tacit verdict of humanity that these emotions are not solely referable to the body, we have the expressions, "loathsome *sight*," "fascinating *woman*," "hateful *delay*," "he treated me with *contempt*," and the like; and this is one of the signal examples of *naivete* being acute, whether by intention or not, with perception or without it. But *naivete* is far more concerned with complexes than with the other

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data of consciousness, and for this unexpected correctness it must not fail to have due credit.

24. The following are the complex emotions which do imply the existence of sentiments.

(a) *Reproach*. This is composed of anger and the tender emotion.

(b) *Jealousy*. In this we find a painfully checked positive self-feeling plus an oscillation between revenge and reproach.

(c) *Vengeful emotion*. This is a compound of anger and a wounded self-regarding sentiment. By the latter expression is meant that the insults one receives, if not at once resented and paid for, lower one in the eyes of his fellows. And in this predicament, (manifesting a wounded self-regard), it is curious to note, that, no matter how many eyes are turned upon one, the social center of gravity is not thereby settled in the object of such regard, but way off, as it were, clear outside the situation. It is as if the terms "beholder" and "beholden" in this case had absolutely nothing in common.

(d) *Resentment*. This is what becomes of the vengeful emotion when the insult is at once avenged. It is perhaps nowhere better illustrated than in the treatment of a subjugated nation by its victor. I do not mean the payment

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of indemnity, or the other material symbols of conquest, but the lasting desire of the conquerors to see the individuals of the losing nation humbled and browbeaten. It is as if on the material side an eye would pay for an eye, but on the sentimental side, a whole jaw were none too much to satisfy the loss of a tooth. Stirring a nation to patriotism, likewise, is often nothing more than arousing a feeling of injury by generalizing, and sentimentally magnifying some forgivable misdemeanor that was never meant to provoke the use of cartridges.

(e) *Shame*. This is a struggle between self-display and self-abasement, with their attendant emotions of positive and negative self-feeling. Just why shame, as a weakening condition, should have been so largely used in matters of moral significance, is easier to determine from a legal than from a psychological standpoint. The legalistic view of good and bad makes special use of this sentiment on the ground that the intensest subjugation is justifiable. Psychologically, there is nothing to oppose justifying the means by the end, if the end is worthy; but as soon as the question of which end is worthier is introduced, the status of the shamed individual must come in for its share of consideration. When the struggle be-

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tween self-display and self-abasement, as in shame, becomes reconciled by a blending of the two, we have, instead,

(f) *Bashfulness*.

(g) *Remorse* is shameful and angry regret.

(h) *Joy* is separable into what is called the esthetic pleasure of contemplation, (with which we shall deal in the last chapter of this book), combined with sympathetically induced pleasure, the tender emotion, and positive self-feeling.

(i) *Sorrow*, on the other hand, is not the negative of the above, but rather composed of a baffled tender emotion, (such as occurs in death and the loss of the recipient of affection), pride and hope negated, and negative self-feeling. Sorrow and joy are usually spoken of as antithetical, but by analysis, only one term is seen to be logically negated in passing from one to the other. Their antithetical character depends upon the motor possibilities which can be stimulated under their dominance of the organism. In this respect, psychological opposition and logical opposition have many interesting differences, which the student should carefully find for himself, inasmuch as erroneous inference arises from the confusing of the two.

(j) *Pity*, McDougall calls the tender emo-

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tion, tinged with sympathetically induced pain. Pain in this sense, as well as pleasure as above used, never refers to what we meant in the first chapter by the sensation pain or the sensational attribute pleasure. For pain, one should here substitute unpleasantness, and in emotional complexes he should also regard it as much stronger than sensorial feeling-tone, inasmuch as emotional discharges are stronger than trophic releases. Furthermore, when there is lacking the release of the suppressed energy in emotions, there is functioned both negative self-feeling, and that which McDougall, whom I have generally followed, means here by pain.

(k) *Happiness* is enumerated at the close of the account, and it appears to mean a general bodily buoyancy as a result of clear perception and satisfactory functioning. But we are here on the border line of ethics, the psychology of which must be reserved for the following and final chapter.

25. *Mood* is hereby defined as a co-conscious appearance of any emotion or sentiment. It may be strong or weak, and when linked with some specifically characteristic motor manifestation, it is called temperament. It is significant to note that both mood and temperament may be functioned side by side with certain further-

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ing perceptions, but this fact of togetherness does not make mood and temperament strictly perceptual in character. All suppression is accompanied by the expenditure of energy, and whenever suppression occurs, it means both less than the normal amount of clear perception and less definite motor functioning on the basis of a furthering pattern. In all these sentiments, it is plainly seen that the thesis of this chapter in regard to the disorderly object or situation as their stimulus, and a mal-adjustment to the situation as their motor aspect, need not be recanted.

The Crowd.

26. The social order, in which we find ourselves irrevocably embedded all the while, is one of the environments to which we cannot help but respond. It is not the only one of this kind, however, and even though it be a disordered object, it yet lies in the midst of another environment, called, for want of a partisan term, the universe. Now the conscious cross-section not only contains responses to society, to sense data, and to perceptions; but we also respond to principles of order, and to things which are neither mental, physical, moral, social, or artistic, but which are the stuff or stuffs out of which these orders are generat-

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ed, and into which they plunge more or less firm roots. This merely in passing, for the business of psychology, while concerned with responses, (and thereto with all the responses that an organism makes), has not within its province the ordering of non-human responses and tendencies, but only of those which can be glued to pronouns of various calibre. And one of these pronouns which we shall straightway consider is the pronoun "we."

27. The pronoun we, with its other forms of they, us, ours, their, them, and the like, is symbolical of that domain known as the *Crowd*. In this connection the material here presented is drawn from Gustave Le Bon's account of "The Crowd," all of which would amply repay perusal. The crowd is a curious organization. Its intended perceptions are swamped by instincts and emotions, and its deliberative power is in inverse proportion to its size and the proximity of its members. A crowd may be any group of people in one area, in sight of or bodily contact with each other, or, it may be composed of spacially isolated individuals responding to the same or duplicated stimulus. The crowded spectators of a base-ball game are a crowd, as well as the isolated readers of the morning paper at the breakfast table. There

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are two main types of crowds,—heterogeneous, and homogeneous. The first of these consists of individuals casually and haphazardly brought together. No deliberation or choice exists on the part of the members of such a crowd, leading them to just that place, or exposing them to just those other human beings thus met. The heterogeneous crowd is of two subsidiary types,—anonymous and not-anonymous. Street crowds, base-ball crowds, circus crowds and the like, are anonymous; while juries, parliamentary assemblies, college faculties, lodges, and church gatherings, are of the second type.

28. All such assemblies, whether suddenly congregated, or slowly agglutinized, are under the sway of unconscious sentiments. Every different nation is typified in the manner in which groups of its individual citizens get excited and pledged to some cause or movement. A crowd will demand anything its leader emotionalizes them to demand. But who is its leader? Not the speaker who happens to be addressing them or leading them on. Not the principles enunciated from a rostrum or the slogan into which he crystallizes their opinion. Their leader is rather the summation of their smothered emotions, their unformulated dissatisfactions; for the thing for which they vote, cheer, or pour

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out their energies may not be at all that which they, as individuals, in calm moments, might determine upon as something desirable. It is only the fact that something is presented to them as being in a like condition to what they imagine themselves to be which arouses their enthusiasm, and this vicariously functions the exhibition of emotions, sentiments and instincts in its behalf. All heterogeneous crowds are an example of co-conscious and unconscious functioning of a disorderly object. In all such groups there is a slight inclination toward anarchy and barbarism.

29. Homogeneous crowds are divided into these three groups, sects, castes, and classes. (a) *Sects*, whether political or religious. In all sects, the individual members may differ very much as to education, caste, or profession. But the unifying element in them is some principle which is of another series than their education or profession, and to which these make no difference. Some belief is aroused, some need for its application is shown, and the rest follows. Further unification comes through the expenditure of motor energies to the cause; wealth is poured out, buildings are erected to house the assemblies of the members, and the strength or weakness of the belief in the principle of the sect

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is manifested by the number of things they further in connection with their material development. A belief is a meaning, and therefore it is tested for its tenacity by what those functioning it will do upon occasion or in a crisis. Its strength or weakness, and its truth or falsity need have no connection. The pragmatic test of history as to whether beliefs have held, and the logical analysis of their terminology and coherence, are two separate and distinct items; the pragmatic test is an emotional one in this case, and the test of analysis is one of perceptual character. The first is an example of informal logic, the second, of the logic of exact formulation. It need not surprise the student of exact logic to find that analysis usually discovers nothing stable in all forms of popular beliefs. It is only in the science of psychology that we find a complete account of erratic emotional functions.

30. (b) There are three chief *castes* among Anglo-Saxons, namely, the priestly, the military, and the host of occupations. In these we find the highest type of crowd organization. The labor unions, it is safe to say, represent the most unsettled type of caste,—the other two, the priestly and the military, represent more systematic stratification, with a resultant of sat-

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isfaction and contentment with their lot. In heterogeneous races the volatile and mercurial elements are necessarily predominant, and the era of strikes is unavoidable in a people just coming into individuality. In such cases, the caste may be said to be crystallizing. On the other hand, where several generations of the same family follow the same occupation,—thus making a homogeneous race in point of completed stratification,—no disturbance whatever is so emotionalized as that which threatens the downfall of such a caste system into which the individuals have been cemented. One might again point out the fact that no matter how much we clamor at times for a change, the record of past events shows that those who clamored loudest, were the most unwilling recipients of it, as well as those who sank back the soonest into their former condition.

31. (c) We usually enumerate three *classes*,—the peasant, middle, and aristocratic. The habits, education, and interest of the individual members of each of these are very similar. Sometimes it is difficult to draw the line between the members of these three classes, there being many kinds of recognized aristocracies, such as those of wealth, of talent, of intelligence, and so on. In classifying classes, how-

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ever, the monetary test is usually applied, and the border line cases omitted. By this means, also, it is easy to see why these classes have the poorest form of organization of all crowds, whether heterogeneous or homogeneous; for all those in the peasant and middle classes who are struggling out of them do not want any organization that solidifies their position in that class, and the rest are too busy maintaining their position to become organized. The *nouveau riche* furnish in this instance curious hints of the momentum which economic conditions give to functions of a social character, for their unconscious complexes, becoming suddenly released, indicate the disorder which the condition of sudden wealth produces.

32. When a crowd functions some punishable disorder, it becomes a criminal crowd, or mob. But no one person in a crowd is doing exactly what the whole crowd may be said to be doing in such a case. In fact, nobody is at the head of a crowd. It has no head, for it is only releasing collective complexes, only satisfying its collective grudges. The ringleaders are usually punished, because the law demands a victim; but the ringleaders are often only those spacially in front of the others, and only seemingly more indecorous than those pushing from

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behind. Thus when one asks, "who started the rumpus?", it is not altogether a joke when each suspected culprit avers to the contrary. But, as Le Bon says, "All collectivities have it in them to develop to a high degree certain ferocious and tender instincts." For the collective mind is an accumulation of suddenly uncorked suppressions, and what is done by it is a function of the environmental possibilities of the situation as well as of the individual complexes. The crowd usually demands some one to be its leader as well as some candidate for anathema or praise. If a crowd is witnessing a fire at night, when a rescue is attempted, it is sometimes pathetic, sometimes ridiculous, and again sometimes terrifying to see how the crowd both tenderly nurses along the rescue, and also threatens an unsuccessful rescuer with the death he failed to avert. It roars and defames, it weeps and cries, it groans; it uses the same words in a "sacred and hushed tone" as it does in yelling and shouting. Here the object eliciting the responses is clearly a disordered one, though often hard to name in exact terms.

33. Deliberative assemblies have worked out a system which substantiates my thesis in this chapter. Important measures are first presented, then debated, then referred to a com-

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mittee, and so on, in order for the emotional element to have its little part, if need be; but also in order for the measure to have its logical and perceptual inning as well. Often, indeed, a committee or a single individual drafts and adjudicates a matter with but the scantest reference to the collective body that finally passes on it. On this principle, absolute monarchy is worthy of some consideration, psychologically, as well as such forms of government known as oligarchies and aristocracies, in the strict sense of these terms. Popular government is based on the idea that the many think better than the few. Psychology has nothing to say about government, but only about crowd organizations in point of which this further quotation from Le Bon is pertinent: "In any deliberative assembly, called upon to give its verdict about a matter not entirely technical, the intelligence of the individual members counts for nothing."

34. The jury is a heterogeneous crowd, formed on occasion into a deliberating body. Why twelve members should constitute it is referable to informal logic. Juries are usually made up of strangers, and as such represent an organization in which the knowledge of other minds engaged in the same work as one's own is supposed to count for nothing. This may or

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may not be so, but it is only for us to say here that after a jury gets into the jury room to consult and deliberate, the results show something quite irreconcilable with the notion that the jury does not behave as a heterogeneous crowd. Juries are not unimpressible by the prestige, wealth, beauty, widowhood, countenance, and so on, of those witnessing, or on trial before the bar; and their emotions are often the only hope of the lawyers functioning in the case. Even though argument and debate are indulged in in the jury room, the crowd character is never sub-focal there. Stubborn men have also been known to completely reverse the tendency of the first ballot,—it being a test of endurance rather than a careful, cool deliberation which decided the case. It is the opinion of more than the writer that all juries should be forced to take a cold bath before going into the jury room, and should further be obliged to avoid all vaso-motor constrictions by whatever means would be safest and quickest at the same time.

35. The informal logic of crowd reasoning is evidence of the disordered environment which it is functioning. The most exaggerated and ingenious sentiments are indulged in. The crowd never distinguishes between the actual and the virtual, between the possible and the

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impossible, or between the internal and external aspects of the thing presented to it. It demands "equality," or "liberty," or asks things which are entirely beyond its power to use. It scorns a feeble, but reveres a strong authority; a reported weakness in the government will raise a mob very easily, but the report of even iron-handed dealings will at once quiet their emotional unrest. "Might makes right" is actually crowd reasoning, whether it be also true, false, or absurd. Catch phrases, slogans, and shibboleths, are just the material out of which crowd reasoning is constructed. The orator who addresses the crowd on the street need say nothing rational, just so long as he speaks in terms which the crowd will interpret as being "what it thought also." An emotional collectivity thinks and speaks anything at all, the more disconnected it is the surer is it of being emotionally functioned; and so such things as analogical reasons are cheered as the very acme of truth and right. Crowds are also impressed by the marvelous. They demand some authority, and in lieu of living governors of men, any dead hero or nebulous ancestor will do very nicely. National figures of the past century, traditions, the longevity of customs, the greatness or decline of an institution,—all these

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stimuli manifest a universal tyranny over all sorts of crowds in all sorts of nations and ages. "The one tyranny humanity has always been under is the memory of its dead." But shake once the confidence of a people in its past, and you will find that "the end of a belief is the beginning of a revolution." And it is not amiss at this point to recall the passages in this book on auto-catalytic action as the basis of neural momentum, with the other remark about the desire for change we so often function in speech. For the crowd is after all only a magnified individual, and in the midst of a crowd we can often detect more of our smothered emotions and tendencies than in any other situation that offers itself. Neural unification is rare, while self contradiction, which is a function of chronic, unresolved neural inhibitions, appears to be not only one of the chief products of any and all instinctive and emotional manifestations, but indeed their source.

36. Another form which the emotional complex takes is the *dream*. This normally occurs in sleep, and is the rearousal of forgotten or suppressed ideas which have not been functioned during waking hours. It is substantially the revelation of a wish,—by which may equally be meant the hope that something will

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happen, as well as the fear that something might happen. But in either case a dream is an un-shot residue of emotional or instinctive functioning,—the back-water of consciousness. Before entering into the physiological or ideational processes which give dreams their being, it will be profitable to consider briefly other forms of the rearousal of past consciousness, in order that comparison, contrast, and orientation may serve as means whereby they may be better understood.

37. These other forms are *memory* and *imagination*. Memory has until recently been considered as something which resided in certain cells of the cerebrum, and which, by a process of irradiation or some such neural release, got into consciousness. Both of these views,—that of its being a single process, and that of its being the dormant content of special brain cells,—are not to be upheld in this book. There have been found in laboratory investigations not one but four different modes of rearousal of past events, none of which give memory contents exactly identical with the original. Memory, far from being a reduplication of the object, is a tendency to approach the class of objects of which the sense datum remembered is but an instance, or a member, and when this

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memory content is fully developed, we have concepts, rather than percepts or sensory details. So that every remembered object is on the way to generalization or conceptual content. On the other hand, the four kinds of rearousal of the content differ much from one another. And there is always a gap, a latency, between the sensorial presentation and the recall, and what is going on in this gap escapes introspection. We have seen the particular object, let us say, but when the rearousal comes, we shall then be visualizing only that general class of visual phenomena instead; and this gap or latency is the time in which the particularity of the content is being lost. But this is nothing outrageous, for the particular object was also a member of its class, *particular* in this case meaning only that certain specific members of the series constituting it were functioned together. And each of these members had affiliations, common parts,—functional or contential,—with many other members of those series. Such, indeed, is often the case even with sensation. The paradoxical cold and heat, the tickle sensation, the estimation of movement and so on, all differ at times from the mathematical and physical status of the stimulus in ways that are familiar enough to need no exclamation points

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as we pass. So that while in the focal area of consciousness we function with the words "this particular one," the sub-focal areas of consciousness could be as well functioned by the expression, "one of those which has been functioned before," as by other words referring to focality. Thus it is that when the object is removed from sense focality, and we recall it, while mentioning it or not, what gets restored in after-imagery is that cross-section of the series making the object, which will be normally functioned with the least effort possible. But mark, that an intense effort to recall something is always accompanied by a tension in the body, as well as by an effort to place our organism in the identical relation to the absent stimulus as it was to it while present. For ideas are functioned by the aid of bodily attitudes, just as emotions are functions of the general disturbance caused by our bodily mis-orientation with the situation.

38. The four ways of reinstating absent stimuli are these. 1. Perseveration, which means that, shortly after its disappearance, without any mediating focal ideas, there is a recurrence of the original idea. 2. Persistence, (which usually occurs in fatigue or exhaustion), whereby is meant that ideas become repetitive

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because we no longer perceive differences, or react in a discriminating manner to the sensory present. 3. Iteration, or the random recurrence of fleeting impressions, and 4. The free emergence of those things we have often functioned, especially motor habits. Now if any one wishes to know how the absent object gets reinstated, or past functioning repeated, the answer is that the pastness or absence of the object is one thing, and its non-dependence upon consciousness for its existence is another. An object is something that will stimulate, whether it be orthogonally disposed to the body and its sense organs or not. The time series is one series and the space series is another, but there are other series, neither in time nor space, as we pointed out in the first part of Chapter III. Things have position in the order of knowledge, as well as in Florida or the year 1914. Things also have position in space twice at the same time and even twice in the same space, if we but open our eyes to that fact.

39. Let this specifically serve as an example. When we hang a mirror on the wall of a room, and stand in front of it, we can see ourselves doubled,—literally projected through the wall into the space beyond. If the wall of the room is continuous with the sheer edge of a

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precipice, we do not see the object mirrored behind the wall tumble into the chasm below, even though its position relative to us is beyond the threshold of safety. And yet the mirrored object is colorful, shapely, motile, almost everything that we are,—except that it has no weight. *But neither have our shape, color, and motility any weight.* So that the mirrored object is composed of all those qualities which are not physical objects. This is also the substance of ideas. This, likewise, is the substance of memories. The mirrored object is faithful to the shape, color, and movements of the original, but the mirror merely analyses out the non-material properties, and is thus a logical instrument as well as a sense organ, strictly defined. If a man is standing in front of a mirror and shaves himself, the mirror, of course reversing every horizontal movement relative to the observer, will betray the slight abrasion that the “real” skin suffers. But while the man’s face has a tiny drop of blood upon it, the mirror face has not,—it has only a drop of *red*, which is one of the essential properties of the contents of the capillaries. Again, “the painted hawser will hold the painted ship,” but it takes a rope hawser to hold a wooden ship. And so on. Thus the point is well taken that the physical

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order of things is not the only order into which they get, regardless of the status of those other orders. But certainly they are not in the same time and space, nor entirely under the same laws as are the physical orders commonly appealed to for truth and validity.

40. This is not only an aside; it is a necessary prologue to the proper understanding of memory and other co- and sub-conscious phenomena. The rehabilitation of the object in some sort of sensory content, faint and unfaithful though it be, is no more *mysterious* than is the phenomenon of mirror space. Nor is the motor readjustment of the body to a situation in which some instinct or emotion is repeated by the mere mention of a word or the presentation of an idea, any more subtle than are the original orders of things which get cross-sectioned into sensation and perception. The objects of memory and imagination have no position, and may be anywhere, just as the qualities of sensation may be anywhere. And memory that comes pat with the provoking stimulus is primarily a function of the bodily attitude. We are set for that recall by a definite motor pattern,—we have crystallized toward a certain set of perceptions, and the sensory or motor ele-

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ments follow as readily as the water from the faucet when we turn it on.

41. Memory, like the word "experience," is used both as a noun and a verb. The distinction is well taken in connection with sensory content, but when we come to the motor memories, we have a more intricate matter to deal with. The memory (subconscious) of the operations of dressing is both a content and a process, let us say; but just where one begins and the other ends is rather obscure. And the reason is, that the clothes we wear and therewith clothe ourselves in the morning, are themselves best defined by the things we do with them. A hat is something that is worn on the head, shoes are things that are worn on the feet, and so on throughout the wardrobe. So that, since these articles are of the class of attributes-things-functions, so are memories which involve their accustomed use. Emotions and instincts are also of this class of objects, curiously tangled and interwoven, so that we have called them functions of the body, not because they are inside of the skin and ooze through the pores, but because their *position* is obscure. We thus refer to the body out of a desire to spacialize them and give them position *somewhere*.

42. *Imagination* differs from memory in

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that it is just a more agile and less personal transformation of the elements of the objects reinstated. James rightly spoke of "the date in our past" which all remembered things have, while, on the other hand, the imagination content was everybody's, being nobody's. But this little hint may serve to make the distinction clearer. Memory is the result of having a motor pattern congruous with more elements that have become ingrained in us than is the case with imagination. There is no difference in the content, relative position, clearness, or other features in both of these rearousals, but only in the familiarity with which we greet them, and memory is called *mine* sooner than is imagination; and *mine* in this case means both periodicity, ingrainings, and readiness of motor functioning.

43. Now for *dreams*. Two main conditions are to be mentioned in this instance,—the physiological and the ideational. On the side of the organism as a contributing element, we find that sleep is the usual state in which dreams occur. Day-dreams resemble night dreams in that they demand a certain lack of motor focus in the body before they come,—a certain preponderance of co-conscious elements. Sleep, by which we mean the condition of a tired body,

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relaxed, unstimulated by sense data, and becoming ineffectual with regard to its environment, is principally accompanied (a) by a loss of blood to the brain and a gain to the extremities, (b) by a relaxation of tone in the vasomotor system, (c) by the retraction of the dendrites, and (d) by a diminution of the supply of oxygen in the brain. And yet, while the majority of functions are dormant, the thresholds are not all high. A mother who wakes not at the thunder storm, but yet at the slightest stirring in the cradle, is set not for thunder but for the needs of her child, and her sleep is thus only partial. Indeed we all sleep thus partially, unless the sleep be caused by intoxication. Let us at once state, furthermore, that this partial sleep is the physiological element in our dreams.

44. Let us clarify this further. If there are any suppressed ideas in our consciousness when we fall asleep, they usually get functioned in some manner not anticipated. Any slight stimulus will be sufficient to arouse them, even if there is nothing more than an informal logical relation between the conscious elements. We do not predict dreams, but we nevertheless infer their origin with surprising certainty. Psychoanalysis, which is usually misreported in popu-

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lar accounts of it, has been the method by which dreams have been pinned to the objects which have stimulated them. This analysis consists in obtaining from the subject, either verbally or in his own writing, all of the ideas which leisurely come in train at the mention of one of the elements in his dream,—particularly those concerning which there is obscurity as to their place or meaning. The subject must be truthful and keep back nothing, regardless of its intimacy or scandal. From the few blessed regenerates who are willing thus to admit their human nature, we obtain valuable information in regard to dreams.

45. Such a train of ideas is called “free association,” but I do not mean by this that it has anything to do with the notorious doctrine of association which every book on psychology seems to find virtue in repeating. According to it, ideas are said to follow one another in the same order as they have been together before, by virtue of their similarity, contrast, contiguity in time, or contiguity in space. Titchener dealt this doctrine its first fatal blow in his reduction of these four categories to one only,—namely contiguity in space, which for him summarizes them all. I shall wipe even this one away. Very little that is temporally

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or spacially together gets remembered, or even *functioned*. And the order of recall does not follow the order of presentation except when motor ingraining has thoroughly taken place. *Ideas are*, according to this doctrine of associationism, not identical with, but rather completely distinct, from things, and between the two God has put a gulf so wide that no one can cross it in less than two leaps. These ideas were said to come and go in the manner of visitors, and furthermore said to have laws of entrance, etiquette, and exit. No such rationality disposes the ideas. Logic is no description of how we think, for thinking as independent of the properties of objects is a downright fabrication on the part of those who must perforce provide something for the soul to do. *Functional dependence* is the law of the connection of ideas that have pattern and sequence relative to the objects of which they are a part; and such trivial categories as similarity and togetherness are wholly secondary. How much, indeed, of the temporal or spacial present gets recalled in comparison with what never gets focally recalled? The proportion is almost painfully small. What gets recalled is what gets into the pattern of motor manifestations, so far as focal consciousness is concerned; and, on the other hand, inso-

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far as the dream consciousness is concerned, the order of recall and presentation is just as random as the emotionality that functions it, while the vagaries of the dreamer are just those shreds and clippings which the release of his suppressions brings to some sort of focality.

46. The material of dreams is mostly derived from the day before the dream occurs. Dr. Sigmund Freud, the Viennese psychologist, who has rendered signal service in ferreting out dream material, divides it into two main parts, namely, the "latent content," or the whole thought-mass of the dream, and the "manifest content," or the part we recall and mention upon awakening. This manifest content is an allegory of the latent content, frequently containing imagery of the most unsuspected things. For example, wishes and emotions expressed in the dream may go by contraries. Suppose we have in waking life disliked some one exceedingly. The dream may represent us as putting that person out of the way, and then being bitterly sorry for the deed. Or, we may be dreaming of saving his life as a sign that we wished him some, but not the extremest, harm. The important space and time values of the events of waking life may all become distorted,—the things occupying the smallest or largest

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spaces in dreams usually being opposite to their size in the waking estimation. Again, two persons manifesting the same emotion in a dream usually are found to represent the same personality. As a general thing, also, the concept enters in largely,—dreaming of an immigrant will typify strangeness, timidity, or the fear of a new venture, and so on.

47. Now all of this material comes from past life and not from some spook who inhabits the corners of the brain or the sleeping room. The sensory vividness of the dream usually refers to the events of the day before, while the rest of it is the releases of tension which social and other pressures have necessitated. Five main sources are to be mentioned in this connection. (a) Any interrupted thought not finished at the time. (b) All unsolved problems, which will tend to be flashed again and again upon the dreamer's consciousness in kaleidoscopic form. (c) Rejected or suppressed trains of thinking. (d) Parts of co-consciousness aroused from the previous day's life, recollections of where we hid things, or inadvertently put them away. (e) Indifferent or floating impressions of things. The making of the dream out of these materials is accomplished in the following way. First, there is the principle

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of *condensation*. Every element in the manifest content represents several things (not one) in the latent content. Common parts abound. Many anxieties are crowded into one terrifying situation, which by itself, and taken singly, may have little reference to the past of the dreamer. The second element in dream making is *displacement*. The intensity of an element in the manifest content is no index of its intensity in the latent content. Hyperbole is the name we apply to this in matters of speech in waking life. We dream that we are being slaughtered or pushed over a steep precipice. This may merely refer to former situations when some one unwittingly jostled us, or caused us a slight annoyance. The magnitude of the distortion, however, depends upon the emotionality and unification of the personality; the most outwardly modest and pious people may have the worst dreams, but this modesty and piety are no index of their suppressions, which may be maintained in vanity as well as in sincerity. A third feature in dream making is *dramatization*. Curious anachronisms accompany this. Present and past are intermingled, and the here and the far are juxtaposed. The absurd things of waking life become mocked instead, the proud person is given a sceptre, the humble is relig-

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iously turned into a worm, the teacher who "flunked" us is made the fireman in a crematory, the girl who loved us becomes a superb angel. In the informal logic of dreams anything can be expected to happen, for almost anything does happen. We can analyse it afterwards, but not settle upon its course in advance. The fourth and last feature in dream making is *regression*. The abstract things become concrete, and single attributes appear as things. On account of this fact, people have frequently been inclined to place large stock in the flying vagaries of their sensory content during sleep. Indeed armies have been raised to conquer, vast sums of money have been poured out, deprivation endured,—all because some enthusiast with a picturesque vocabulary narrated heatedly his visitations from the "other world." The "inner self" of dreams possesses no such attractiveness to the empirical student of psychology as the naive mind takes for granted to be the case. Dreams typify, and dreams elucidate, but dreams are indices of erratic refraction, rather than evidences of tangency to another cosmos than the one to which we are subservient.

48. Bodily postures during sleep or bodily happenings while we are supine make up a considerable amount of the stimuli to dreams.

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Tickle the neck of an enthusiastic dreamer, and he will be likely to dream of being guillotined as not. Drop a little water on his forehead, and he will think the club of Herakles is descending with its usual velocity. Turnings over in bed, whether involuntary, or elicited by an experimenter, will usually have their effect in the dream content; while too much heat of the bed-clothes, as well as being uncovered while sleeping, will be dramatized into situations of burning or freezing. Dreams of flying and falling are usually correlated with sexual and anxiety complexes respectively, and so far have the students of dreams pursued their analysis, that it is but necessary to tell one of them his dreams and be psycho-analyzed with care, in order that these phenomena be tracked to their true stimuli, and in many cases quite eradicated from the future sleeping consciousness.

49. No sketch of the emotional life would be complete without some account of the *soul*. This word, I am convinced, has both a reputable as well as a vicious signification, and I shall try here to separate them. "Psychology without a soul" has been the vogue for some years, if not decades, and it is the abuse of the term which is responsible for this state of affairs. Private motives, "moral" reasons, and other traducing

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factors have long been called into play when empirical evidences were lacking; and thus the soul, evaporating out of psychology, is mentioned only by a certain few who lay no claim to its validity except on the grounds of custom and reverence for the past. The notion of the soul originated in untutored and uncritical persons, who were at a loss to explain certain phenomena of mental life, as well as in a hurry to get names for things. The names, however, swallowed up the things, and it took some time for this fallacy to be undermined. The dreams of the primitive man, his personification of the elements and forces of nature, his mysterious regard for everything he could not control, and similar functions of ignorance, brought out his naive beliefs into crystallization, with the result that he knew not the difference between himself and the rest of nature. When such a situation occurs, unknowns are in the majority, and the unknowns are taken as the criteria of the knowns. One of the products of such thinking is faith,—a form of scepticism which disbelieves in the full manifestation of the universe at any one time, and is inversely proportional to the amount of true knowledge which the individual is willing to assimilate. Ideals are some of the products of faith, and these, by con-

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taining an element of uncertainty,—a perpetually unrealizable end term,—are forms of the same scepticism. Religion itself is a theory of the soul, as well as a theory of the structure of the world, and the place which human activities have in it. Of these three, its theory of the soul is perhaps the most important, for its metaphysics is frequently deduced from its psychologisms, while its morality is a function of the changing customs of the era in which it flourishes. I shall offer the following theories of the soul, each of which has figured in the past, and each of which is as likely to figure in the future.

(a) *The soul as glandular secretion.* All reference to the soul as being in the body is connected with some organ of the body in which it has its “seat.” “The brain is the seat of the mind, has sometimes been uttered in rash moments; and likewise the heart or the liver or the other organs of vegetation have been given the honor above specified. There is something both reputable and otherwise in this statement, for the body is both the center of the individual’s existence, as well as dependent for its stability upon the cardiac, respiratory, alimentary and other functions. In all emotional states, likewise, there are certain well defined func-

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tions of the ductless glands, such as the supra-renal, the thyroid, and the like, causing the animal better to endure wounds and heal them than otherwise, or at other times. But the difficulty with this theory is that it makes physiological processes fundamental without recognizing that they are physiological. The emotions are disorders, signs of abnormality, and to make the soul as an emotional state, the fundamental thing in human life, is to choose the worst and call it the best. That which was the obscurest, the least known, the upholders of the internal soul have made the cap-stone of their belief, a procedure which is to say the least of it, fatuous. Psychologizing, or the taking of unanalysed psychological data as the fundamental thing in logic, or philosophy, or ethics, or metaphysics, is the name of the error which characterizes all accounts of an internal soul or *psyche*, which inhabits the interior of the body. Such a "gaseous vertebrate" as this form of soul would have to be, must be the one "unmentionable," and therefore reducible to zero for psychology.

(b) *The soul as all the functions of the body.* This theory easily allies itself with the doctrine of "self-expression." One is said to express himself when he does anything that re-

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veals his "inner nature." Being able to find no satisfactory meaning for these terms, I shall have to pass them by. But the doctrine of self-expression must turn out to mean that any and every act is an expression of a self, and thus one has to grade such actions according to some other standard, if the expression is to have any meaning. That which means everything means nothing. Now the soul, as the entire life history of the person concerned, or the present personality,—manners, habits, acuties, emotions, memories, and everything one can name which the organism is doing, is a notion that has so far supplanted the previous one that we might consider it the present day tendency in souls.

(c) *The soul as a specific organization of functions toward a permanent type which constantly evolves the new and the beneficial.* The writer holds that this view is the only one so far presented which requires a special term to distinguish it from mind, personality, or the whole of the cross-section. For the whole gamut of functions of which we are capable is necessarily a developmental series, if there is to be deduction and permanency to it. We saw that the cross-section is full of incomplete series. Attributes come and go, and parts have a share in

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many series. Now when a set of functions freely operates, and operates time and again, there is something more intimate and secure about it than when only random sets of operations transpire. For example, there is a vast difference between the person who always tells the truth, and the person who can never be calculated to tell it; for in the former there is a permanent response to the facts of the case, and a lack of inhibitions against the language reaction becoming a derivative of that function. Not only is there also a vast difference between these two persons in point of social or emotional rank, but the former does not have a divided consciousness, while the latter has. The former has no complexes strong enough to traduce his speech, and the result is both a better organization of his functions, and a chance to become a predictable person,—two things which are denied to the other. This is just a passing example, but it will suffice to give the evidence why such a person whose consciousness is unified should be said to have a soul, rather than the person of whom the same things cannot be said.

50. No more than a bare outline of the emotional complex can be included in this chapter, and the student must look for special treat-

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ments elsewhere. The extent to which complexes abound, hinder, and split our consciousness asunder is revealed in almost every situation of life. The phobias on which venders of patent medicines thrive is but one example. Another is the New England conscience, or the notion that everything must be interpreted in terms of duty. The delusion of "feeling that the eye of God is upon one" occurs frequently among the slightly insane. The general awakening to the destructive effect of such fears is evidenced in certain moral and religious propagandas of the past decade, for whatever absurd metaphysics or cosmology they teach, their general stimulus is a recognized need. And yet, most moral propagandas are based upon the fear of something to a large degree, rather than upon the unification of the personality under a positive principle of incremental benefits. In many a religious code the negative suggestibility is assumed, and certain fears are played upon in connection with sickness, dying and the like predicaments, on the ground that phobia and negative instruction are the fundamental movers of human activity.

51. There are certain other matters connected with emotion and suppression which belong partly in this chapter and partly not in it.

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These are the items in the cross-section known as *interest*, *purpose*, and *will*. They are not nouns, however, but something else. *Interest*, I take it, is the manifestation of constant motor tendencies toward some one special group of objects, plus a satisfyingness at their development. But this satisfyingness is not necessarily emotional, or, if so, it is considered best as emotion arising *after* the results have been achieved. The success of the motor disposals toward objects is often too much to be assimilated, and, in such a case, the disordered state supervenes. However, interest may be very quiet and not accompanied by glandular secretion or vasomotor constriction. It has normally, the same character as feeling-tone,—a readiness to respond again by virtue of a lack of inhibitory tendencies. Curiosity, which enters into interest, was spoken of as one of the safest instincts, and interest is often stimulated by curiosity. A person is interested both in that in which he *says* his interests lie, and also in what he does most without restraint or forcing. When the personality is unified, these two coincide. One may be interested in what he groans to be released from. Some occupation that is hated, some iteration that is disliked, may be the very thing he will voluntarily return to after being

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freed. In such a case the interest is certainly emotional, and as such is a symptom of disorder.

52. *Purpose* is the maintaining of a motor pattern in the midst of various environments, each equally contributing to its maintenance. It includes the element of choice. This choice is free, when it operates without hindrance; it is not free when it is hindered: it is determined when the end to be gained can be gained only that way; it is indeterminate when any end term is equally suitable. Along with these are usually considered intention, or that which one is functioning furtheringly; and motive, or the reason why one furthers it. This "why" is causal, it being the chain of events which lead up to the intention. Introspective psychology was once said to furnish the means for determining all these matters, but it has signally failed. One determines them by observing the organism and what it is doing in the midst of its various environments, and then one asks the doer what he is doing, and these two reports are carefully compared, and the result balanced. If the doer and the sayer conflict in their results, the personality is said to be divided; if they agree, he is said to be unified, truthful, and predictable.

53. The *will* is characterized as the domi-

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nant purpose in the individual. James has given a scheme of the various kinds of wills,—deliberative, explosive, drifting, and the like,—which are characterizations of emotional and temporal manifestations rather than descriptions of what the organism is first and foremost doing in the midst of its environments. For if we but analyse all cases of the will, we find that the thing done, the thing willed, is the most constant response to that environment of which the person is capable. The divided, inconstant person alone boasts of the freedom of the will that is *inside* of him. The rest of humanity are even now falling into the habit of desiring to be predictable. The honesty of the bankers, lawyers, merchants and other persons of the social *mele* is just this predictability of their actions before they are fully functioned. For when a person says that he has choice and can do whatever he cares to do, it means at the utmost that he can function thus once and once only. We are never apprehended by the law until we step over the threshold of social peace. This threshold may be high one hour and low the next, but it is always a definite function of the environment and the organism within it. Freedom of the will has long been a most unpleasant topic on account of its being talked of

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and never carried out. For the *carte blanche* we each of us hold,—the privilege to do whatever we please,—is not a return ticket from certain destinations we could inscribe upon it. And those things we say we can do and choose are limited by, first, motor possibility, and second, by the desirability of the end. And this end, unless we are emotionally distorted, is one of the terms of a series already started, and not something which falleth like the Palladium from the blue.

CHAPTER V.

MATTERS AND MINDS

1. In the foregoing pages I have endeavored to present the nature of the common operations going on within a consciousness. Objects sensed, objects perceived, objects in an emotional complication,—these are the three chief disposals we make of the various series which meet one another to form quotidian things. The various series which get thus concatenated are the ultimate, neutral entities of the universe. When they are considered as being material for responses, they are called matters, and when they are being responded to, and thus united in the with-for relation, they are called minds. In other words, minds are what human bodies do with matters. Matters include minds, but if human beings are to speak in certain ways, the two expressions are required out of convenience and logic. Whether it is underhanded or not, some matters are commanded by way of our being obedient to them, while again out of such dealings come new matters of an order scarcely predictable; for it is hardly likely that some things would have had the factual existence which they do, had not human activities

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played upon their elements, and thereby found parts and functions possessing significant properties of union and mutual furtherance. We arrive on the planet with an organic structure craving food, and clear from the first intake of fluid nourishment to the erection of grain elevators, the human neural response involved is basically the same; embroidered, to be sure, by the constructive functions necessitated by the vast social environment for and against which we strive. Similarly, from the first time we are modest and shy, to the adornment of our bodies with the smothering regalia of collegiate functions, the same kernel of impulse dominates the situation, and the wholesale manufacture of clothes and adornments is the organized social structure based upon it. Such a list could be wellnigh prolonged indeterminately, but these examples will suffice to make focal the manner in which the dominating responses of the human organism not only limit the possibility of shattering the orders which now stand solid from the mold, but also reach beyond the brief present, and control the futurities of most that he call "mine" and "yours."

2. Nevertheless it would be fatuous to credit everybody with motives of a furthering and permanent character. It is contrary to

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fact, and hopeless to find. As evidence of the truth of this thesis; let me but cite how unusual it is to find a calm mind, or a creative mind, or a mind that is truthful, or unshattered by complexes. How few persons, when they close the house door and enter the street and its crowds, do not shut the door upon their permanent motives! Their environments are largely wooden, stone, and wall-paper constructions; and their morality depends largely in the *lack* of annoyances, rather than in the responses to the environments of neutral orderliness. Nevertheless, it is quite possible that perceptions of order may be obtained in the midst of disorder, and since this is a matter germane to nothing else than psychology, here will be the place to outline its development.

3. One is allowed, it would seem, in dealing with those responses called interests, to take a broad perspective of the field they cover. Psychology, as the study of the conscious cross-section, has little need to merely throw its data out for inspection, without throwing out for inspection as well the possibilities of their organization. And, if I mistake not, one of the requisites in stating a problem is to do it in such a manner that the solution will be hinted at in the first formulation. That which disturbs our

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perceptions is the emotional complex, and the first thing to do, if one is to have perceptions of order and motor responses of permanence, is to get rid of all the complexes he can. Death is supposed to do this at one clip, and while there are some complexes which are resolved only by that event, there also lies within the principle of common parts another solution which we are at liberty to investigate. The word "soul," which in the preceding chapter was retained in psychology on good grounds, is a word which should be meant to imply a minimum of emotional complexes and a maximum of clear perceptual and motor furtherances; and it is this business of obtaining a soul, which is the present topic under consideration.

4. In William James' chapter on "The Self," he enumerates various selves which come and go in consciousness. The material and bodily selves he makes fundamental, and the self of the widest and solidest relations he makes the final flowering of neural responses. But the "passing thought," which James made "the thinker,"—the Ego,—is not to be included in this present account, however much assistance I may have drawn from his pattern of personality as outlined in that chapter. At once it can be stated that the permanency of the Ego, or

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self, is the ordinal correlation of the responses of the organism to the permanent orders of the universe. The "passing thought" of James is only the speaking voice, and is over and gone as soon as it is uttered. Not that I would claim a permanence for the self beyond the rigidest empirical evidence, but the "now" of psychology is not necessarily that span of time which includes the passing thought; for the "now" is as long as any permanent interest lasts, and may be years as well as minutes. The engineer who put the tubes under the East River may have planned them for years before they were finally laid, and it is so with such constructions that the permanence of the idea, and its focality in mind is unwavering during the time that the individual is functioning and furthering it. I should call such an idea the source of personality, and I should say also that the mind furthering it was just as permanent as that interest which he was developing was permanent.

5. The self has had a curious history in philosophy and psychology. Descartes was the first acute thinker to ally it with functional activity, for he decided that the phenomenon of inhibition was the fundamental element in a consciousness. Since then, less and less has the notion of a permanent spirit or spook been the

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ruling theory of the self. James was the last renowned writer to assert that "we were always aware of our selves, of our personal existence." This book upholds no such non-empirical principle. We are our functions, we are our environments, and "consciousness of" thus turns out to be merely an expression by which we pay homage to the tyranny of language. Thus "our own personal existence" is a term which is quite incomprehensible when applied to any other things than bare organic functions, and the focality of them in our consciousness. While writing this page, I am not aware of my personal existence, but of the readers who will respond to it instead. Fingers, pens, typewriter and paper are but the media,—the plan it has or lacks, and the receptions it will receive, are the things my mind is made of while performing this function of publication. Even the personal pronoun "I," which is used here from time to time, is the vocal instrument of this permanent interest, and used solely on account of custom and convenience.

6. James speaks of the hierarchy of selves, and makes the material self, which consists of the body, clothes, relatives and property, that from which all the rest of the interests originate as well as depart. The responses of food-getting,

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self-display, reproduction and acquisition are the elements which enter into this type of consciousness, and which have to be satisfied before anything else can have any show at all. Next comes the social self, which is a product of gregariousness, and includes the desire to be approved, the desire to excel, together with the subsequent blames, honors, and satisfactions. Following this is the spiritual self, which appears to be a certain sentimental attachment to one's entire tissue of conscious states. In all this there seems to be a wholesomeness and a catholicity of observation which deserves to be imitated by all those seeking to do justice to the material of psychology. But in his later writings James appears to have laid down another set of principles which, far from contradicting his earlier ones, enlarges them, and his last statements are in almost entire harmony with this book. Consciousness, as a separable substance of permanent character, he denies to the realm of thinkables and existants. The "I think," which to most persons means their soul, he reduces to the "I breathe," and regards consciousness as a function, and not as an everlasting pronoun.

7. I cite this much of biography in order to show that the present development of psychol-

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ogy runs tangent and not counter to the matter of this book, for with what is now known in abnormal psychology added to the development of the old-line psychology, we have more than either of them could have furnished alone. And that more is the principle of the ridding ourselves of complexes by vicarious substitution of the perplexing object.

8. Emotional complexes are usually manifested in fears and inhibitions of a well defined character. The situations in which they first arose may have been private or public. We may have been mistreated or shocked as children, and the recurrence of the situation ever kept arousing the same emotions as the original. We responded in a disorderly manner to the first disordered situation, and were either prevented from resisting it, or thrust more deeply into the mire. Thereafter, whenever enough of the elements of the original situation were present, they summed into a stimulus of the same character as the first, and provoked the same result. For instance, timidity is usually the product of the first few weeks' environment, and timidity is a form of fear. It often happens, therefore, that the new as well as the not-yet-known will provoke the fear response. The child fears dark corners and

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closets, the young man fears the examination, and the old man fears the executors of his will. Those who fear usually pre-respond to the situation,—commonly called “anticipating trouble.” Now the prevalence of phobias, of hesitations, of emotional anticipations, is too wide to need further comment. Once started, it can ramify to all situations having common parts with the originals. But this business of common parts also shows the way out of such a fearing consciousness, for by virtue of perceiving that the fears do not develop in certain special situations, certain other situations can be produced, in which more fearless than fearful elements predominate; and thereby this complex may be signally reduced if not eliminated altogether.

9. Again, the sexual complex, which Walt Whitman facetiously calls the “procreant urge of the world,” is one that frequently dominates the organism. Besides being a need of certain vitalizing functions within the body, it is connected with shyness, bashfulness, modesty, the wearing of clothes, and many other less obvious social embarrassments. Before mating with another of the species, fanciful idealizations, love songs, homages, and various forms of extreme politeness, together, perhaps, with dreams and

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the like phenomena, furnish the only means of harmonizing this predicament with the rest of one's interests. Our acquaintanceships being at the best haphazard, and our friends being those persons we have inadvertantly met, (rather rather than being chosen from a catalogue, or by the mediation of a cosmic duenna), one is privileged to call this insurmountable difficulty of choosing the best permanent companion, the true social evil. But where more than trivial, physiological motives are present, and where the environment to which one responds in such a case is larger than the fanciful passion for ownership, the chances are better than otherwise that the error of rashness may be abrogated.

10. Years ago there was established in the city of Boston what was known as the Lyceum. It was a Greek name, having a flavor of erudition and the classical. Before the establishment of this form of amusement,—for the Lyceum was a sort of theatre,—the New England conscience would not permit itself to say that plays and entertainments should figure in the daily or weekly routine. But with the establishment of the Lyceum, the New England conscious was appeased. The bare change of name, with the feeling that something solid and honorable

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was always to take place under its tutelage, sufficed to release the complex of prejudice against the theatre. Those puritanically inclined, having always secretly wished to go to places of amusement, (but being vexed with orthophobia, or the fear that they had not done right), were now permitted to enjoy themselves. For the Lyceum was nothing more than a theatre, and as such was not quite up to the standard of the better theatres of the country. Indeed, some of the productions were so much worse than those of the regular boards that the Puritans should not have been entertained by them. We now have a replica of this in the productions of non-theatrical entertainers, who furnish amusement under what are advertised as "special auspices." The modern moving picture shows, which always bear the seal of being "passed by the board of censorship," are another partial resolution of the complex against amusements. This account is introduced merely to show the way popular psychology has attempted to reduce certain disharmonies in society, but whether they are anything more than lame attempts the reader is urged to decide for himself.

11. Suppressed ideas also take the form known commonly as lying. In this case speech does not function for the facts of the environ-

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ment, but rather for the dominant motive which is in disharmony with the sensory and perceptual environment. It is the business of ethics to decide whether there are justifiable lies, but it is the business of psychology to infer the subsequent harmony or disharmony of any such suppression. The effects of this sort of functioning are cumulative, and the full releasing of the complex often demands that one put aside dozens of acquaintances and almost isolate himself from all those whom he knows. The fund of "conscience money" which now amounts to considerable in the United States Treasury, is the result of the voluntary release of this complex on the part of the contributors to that fund. That no publicity attaches to the reception of it by the government, is a sign of the general increase of sanity. For we are coming to know that it does not require an emotional orgy to release an emotional complex satisfactorily. The wilful or stubborn child, who may become so through the parental environment of cruelty or ignorance, soon learns by imitation to accomplish his ends by means of rendering a false account of his doings. Whatever else four-year olds are, they are perceivers of subterfuge and insincerity, and the "strange and unaccountable misbehavior" for which they

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often get punished is nothing more than the naive responses to a false situation. To obviate this, a genuine disgust at indiscretions on the part of the elders should take the place of verbal maltreatment; for unless this happens the situation will be one that gets complicated, rather than obviated, in the future. This is merely a hint as to what can be done under sincere conditions, for otherwise the sham is more obvious than the attempt to conceal it. Of course, one must be forewarned in all this by the dictum of Socrates,—“Virtue can be taught, but there are no teachers.”

12. In certain cases, there is no other way to release emotional complexes than by the use of emotional situations. A consciousness in which only perpetual turmoil exists,—in which the complexes are too numerous to be released through calm considerations of the larger environment habitually refused,—can perhaps be resolved into something harmoniously furthering by an emotional explosion of large proportions. This is one of the things which both tears and laughter accomplish. We do not point to these as ends, however, but only as second class means, for the consciousness that is only brow-beaten and humiliated is fit for nothing but the milder emotions which usually super-

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vene. Nevertheless, this form of release is found effective, for the release of all complexes is to be desired at almost any cost, though it sometimes becomes a matter of choosing between the zero of stability, and the maximum of instability. In the large, there is less clear perception than emotion in the common consciousness, and the predicament thus entailed is obvious. I suppose the ethicist would say that whatever enters curatively into such a situation is a good, but he is not urged thereupon to decide.

Psychology of Value.

13. The psychology of value enters into considerations of the cross-section whenever we have dealings with the good, the true, and the beautiful. The first concerns the psychology of morality, the second the psychology of reasoning, and the third the psychology of art. Values are the permanent, non-contradictory stabilizers of social and personal interests. A value is, for psychology, then, the functioning of this stability and the satisfaction derived from the things thus stabilizing one. A thing is *good* when it stabilizes human relationships with resulting satisfaction,—in other words when neither perceptions, motor responses, nor feeling tones involved are contradictory. A thing is

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true when it compares with the observations, when it is not functionally opposed to the statements one would make in which those same observations could not figure, and when it can be shared with other observers and makers of statements. The psychology of this is contained in the perception of the facts entailed in the statements, and in the naming and arranging them in a connected discourse. Something is *beautiful* when it produces a harmonious state of mind. The criterion here is, however, the harmonious state in minds which are not riddled with emotions. Beauty can be measured. The structure of paintings, symphonies, cameos, pottery, is open to any investigator, and their order, which is the kernel of beauty, is amenable even to yard-sticks, and the machinery of physics. The psychology of beauty is the correlation between the balanced bodily state and the balance and order in the beautiful object. Now all these in slight detail.

14. If one asks how permanent a value must be, in order for it to be a cardinal value, no answer is obtainable from a psychologist. He is solely concerned with the continuance of the functioning of this more or less permanent thing on the part of the organism which is his study. It can be functioned for a fraction of

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a second, or for a lifetime. Indeed, some of the functioning in this manner is but analogous to after-images,—the existence of the value as a content of consciousness having ceased. Thus old customs and discarded slogans, to which many persons still attach a huge significance, are but functional after-images of stimuli which have evaporated. They are, then, only eccentrically referred to an environment which, on the basis of emotion, has common parts with the residual functioning.

15. Morality is the realm of goodness, and the psychology of it is concerned with the perception and motor functioning of the stabilizers of society, whatever these may be. Instinctive and emotional actions, the ubiquitous crowd, the functioning of more interests than can be all at one time furthered, brings us either to the perception of order and plan, or to the brink of unsettledness and hesitancy. So that the good thing is either that which stabilizes before any disorder occurs, or which stabilizes afterwards. The words of Aristotle, "virtue is not virtue until it becomes pleasant," may be said to apply to the first case; while any response to an S. O. S. signal would be gruel for the second. In either case, the maintenance of an unbaﬄed interest, stable enough to tide one over the next

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period of indecision, would have to be called one of the items in the psychology of morality. The selection of a dominating interest would be another item. The perception of its possibilities, its history, its likelihood of getting permanently functioned by the organism, would come in as the rational elements of the choice. Then the testing it out with all sorts of conditions operating, the acceptance of it with intentional enthusiasm, with intentional scepticism, and with intentional neutrality,—in order to obtain a balance,—all these enter in to the psychology of settling the problems of morality. And while this is but a sketch of the matter, it must suffice.

16. Truth is a hard matter to get taken seriously in this century, chiefly because it has been taken too seriously heretofore. It is now generally conceded that the difficulty was solely of language,—we were asking what *truth* was instead of asking what was *true*. It is thus with most of the old, large “mouth-filling words” which modern logic so closely scrutinizes. Capital letters cannot make nouns out of casual adjectives and adverbs. We ask, then, what is the psychology involved in finding a true statement, rather than in finding out what is capital “T” Truth. Now the significant item

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to be considered at this point is, that we do not start to "think" *logically*, but only with the informal logic of scattered ideas. The pattern may be there, but the set terms that can be generally understood, as well as the fixed expressions which are to embody them, are not what we get in the first functioning of the material of logic. The whole process can be well compared with that of distillation. The crude stuff is the mass of ideas with which any formulation starts out. Then comes the linguistic expression, or the first thing refined out of the viscous mass. But this is frequently too individual, too private. It must be laid aside to cool, then taken up again, and redistilled, and spoken, then oriented among those terms in which it is to be embedded, scrutinized as to common parts, common functions, special importance in that environment, and so on, after which it is ready for publicity. This is the work of words, whose meanings lie in what others will do upon their being singly or serially uttered. Logic is not a study of how we think, but a study of the responses that a certain pattern of words will get in a certain environment. If one wishes to be understood, he speaks thus and so. *Only when* words are in such and such a pattern, will they be understood as meaning this and not

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that; one *must* speak clearly if he *wishes* to be understandable. These are the elements of the psychology of logic, and logic has validity only after such a thing is accomplished. Any psychologist can tell us how he thinks. Random, inchoate, tattered terms or ideas are the first step. Anything whatever in the way of an idea will start it,—there is no *one, identical, invariable way in which we start every logical utterance*. For patterns that will do in logic are empirically tried and disposed of in one way or another, and not cooked up in some dark mental abyss perpetually veiled so that none can enter and peer about it. Logic has nothing to do with how we *think*. Logic has only to do with how clearly and unequivocally we *speak*. The psychology of language is the closest field to logic, and thus the psychology of speech concerns the question of functioning one of the dominant motives in consciousness at the time, whether it be focal or sub-focal. For what the logicians, who have tried to describe the way we think, are after, is the vain goal of contents in the sub-conscious,—things which do not exist.

17. The term “reason” and its derivatives have been used more often with a psychological import than with a logical one. “He acts rea-

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sonably," "it stands to reason," "rational thought," and similar expressions, do not always mean something logical. They more often refer to the connectedness, or the easily flowing character of the thing mentioned in that context. Coincidence is taken for intention,—a factor which is psychological rather than anything else. Now reason is not so much a noun, as it is a term which refers to the pattern of the expression that is used to convey a meaning. When judgments coincide in their salient feature, there is said to be a case of reason. Again, where one can start a chain of expressions,—none of which need to be bristling with common parts of each other, but which all together make a system,—whence something can be further implied or inferred, there is said to be rationality in the connection. Judgments, on which these connections depend, are terms in relation, implying classification among terms, or correlation with relations or functions. The logical mind is the one which judges, tests, and formulates the position of one term within a context of other terms; tries every functional connection it has with all the terms of the series implied, and concludes, not that something *must* be true, but that some expression has been found in which every term is satisfied, and every

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term of which can be exhibited. But logic is also concerned with any and all statements, true, false and absurd. "And thrice he slew the slain," is just as good an expression in logic as "And $3/4$ he slew the slain," or "And 3.14159 he slew the slain." For the question of how often the slain can be slain, is a question for the logic *and* psychology of slaughter. When this is decided, *if* there is anything left of the statement, then logic can again take it up and decide its status. But slaying is not logic,—slaying is motor reduction of splanchnic incoherence,—and thus logic is the arbiter of the formulation of expressions, and not of the source of them.

18. From the foregoing it can be seen that there may well be certain expressions which have nothing logical in them, even though the same expressions may be effectual for motor arousals. Take the case of a patriotic oration which bestirs its hearers to deeds of valor and sacrifice. The verbal contents of the oration may be, and indeed, nearly always are, absolutely meaningless, insofar as strict logical analysis is concerned. Again, every national anthem, if reduced to prose, and tested by definition, is found to be incoherent. I need not recount favorite slogans or shibboleths in detail, but if one is interested in strict logic, let him

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examine the so-called "famous expressions of great [or excited] men," and he will see that many things which have proved "pragmatic" or effectual, are verbal responses to disorder, and nothing else. That they have moved sects or nations to attain certain ends, is not the point; the point is whether they have been worthy of the motivating influence they have had, for, as they stand crystallized into words, they deceive us. In every text-book of logic there are enumerated certain "fallacies," or incorrect ways of formulating one's statements, and these fallacies are all reducible to either in-coordinate or absurd speech. The emotional complex in the "fallacy of *ad hominem*," the in-coordination of perceptions in the "fallacy of *non sequitur*," the emotionalized pre-perception in the "fallacy of *petitio principii*," are more psychological than logical fallacies, since they have their roots in the primary functions of response. The strictly logical fallacies, on the other hand, are those which involve the resorting of data, and concern inexact formulation.

19. We must now briefly consider several forms of art, and take stock of the chief psychological elements therein. Arts are of two kinds,—the time, and the space arts. Of the first, we usually enumerate poetry and music as

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the chief examples; while of the second, painting, sculpture, and architecture are the most prominent. It is interesting to note that a "time" art is one that chiefly concerns hearing; while a "space" art concerns sight. The latter class also depends more upon the motor manifestations of the hands than does the former, though this dependence is not exclusive.

20. *Poetry* is defined as rhythmical words. This does not mean that the words need have a connected meaning. Rhythms are sets of impulses which have a pattern, exhibiting contrast effects correlated with organic impulses. A rhythm differs from a bare repetition in that it exhibits grouping. 3/4, 4/4, 5/4 time in music or poetry means, that the first note of the bar gets the only voluntary accent, the rest being functioned on the momentum of that one. No such momentum appears in a bare succession, and such a succession we call monotonous. Professor Muensterberg calls monotony any "succession that is hated," but such a definition does not exhaust it. For the monotonous is primarily that form of succession which fails to save energy in the organic responses we give to it, and thus it becomes irksome. Gummy bearings in machinery, and monotonies in succes-

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sions of impulses are more than analogically related.

21. Poetry is characterized by something further than rhythmical language, however. The choice of fine-sounding words is of great importance. Only certain words will produce a poetic effect, by which we mean specifically a mood-complex, plus a rhythm. Now moods are co-conscious arousals of smouldering emotions, and thus poetry is not designed to effect a full focality of the idea involved in it, but rather to arouse a consciousness sympathetic to the complexes of the poet. Poetic words are thus not noted for their clarity, directness or specificity; they are musical elements, and not informational. Further than that, the motor elements of the recitation, and the listening to poetry both evidence to what a large extent the co-conscious enters into art. My own investigations in poetry have led me to state that "euphony" is reducible to "eu-kinaesthesia,"—any sound whatever being pleasant, whose utterance does not bring into focality the mouth movements of the one speaking it. One more fact in respect to the words in poetry: we often are enabled to read some works in a foreign language and get the idea of them without being able to tell exactly, word for word, what it differentiatedly means.

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This is due to the co-conscious arousal of the mood by means of sounds alone, and the rest follows readily after; for just so long as the tones of the stimuli further the pattern once started, so long will the sufficient half-hints of meaning come, summate, and satisfy.

22. Rhyme and alliteration are musical elements. They perpetuate a tonal focality, while they also produce a non-focality of concrete discourse. If one repeats any word over and over again, and watches how the meaning slowly evaporates the while, until only the sounds remain, he will have demonstrated the essential element of rhyme and alliteration. The pattern of rhyme having once become established, and the mood firmly fixed in the reader, almost any combination of words may get taken for its face value. Now the point to be stressed in all this is that poetry is not originally clear as to its meaning, and so whenever rhymes need to be completed, or rhythms filled in, the poet is not beyond the temptation of completing and filling in with whatever material he has at hand that will not interrupt the mood. Art of this form, in that it uses words, must be said to *abuse* them from the standpoint of logic, whenever such a sacrifice of sense to sound takes place. Ultimate judgment, however, is based upon the

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intention, plan, and effect of the poetic material; and the what, how, and why of these is just as determinable by those not carried away by the poetry as much as by those who are.

23. The basic psychological elements in *music* are those of tone and rhythm. By not employing words, music is a purer form of art than is poetry, since it requires no reference beyond itself for its means or ends. Now melodies are rhythms in the sense of possessing pattern. "The melody goes of itself," we sometimes say, and by that phrase we mean that only the first impulse needs our undivided attention, after which the rest follows as a sort of momentum. Another point to be noted is that melodies are affected by tonality in a way not deducible from the original presentation of them in one key. Certain musical compositions lose all their "character" if played in a strange tonality; even the composer Schubert was once entirely deceived as to the source of one of his own "Lieder" by this means. For dramatic effect, nevertheless, a composer often changes key without changing the melody; and canonic and contrapuntal forms abound in similar features. Such a procedure effects the organic accompaniments of music to such a large degree, that the lack of doubled intensity with doubled

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parts is often counteracted by this means. Harmonization of a melody is actually the accompaniment of one melody by other melodies, so that in listening to a rich harmony we are focal to but one or two of the melodies then operating, and co-, or even sub-conscious to the others. It is upon this that the mood-character of most music depends.

24. One form of musical composition, known as "program music" attempts to be onomatopoeic. In such music there are melodic structures which are planned ahead for the effect they will produce, and labeled by the composer, furthermore, as such. Certain instruments lend themselves very well to these things, and "storms," "pastoral scenes," "military events," and the like, are quite more than symbolized in this manner. Recently, however, (since 1840), there have been schools of composers who have attempted to portray anything at all by means of orchestral tone-color. That is, they have endeavored to equate musical phrases with poetic speeches. I cite this fact here particularly to show that art forms are not all developed out of the spontaneous moods of the artist, but can often be the result of deliberate intentions. For, while music may not be entirely reducible to physics and physiology, yet,

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if one physically studies a rhythm, and sees what it is composed of, he may, if he is astute enough, deduce a "new" form from it, which has value in art. But it is safe to say that the series of art forms which get constantly developed, are asymmetrical, and single, linear ones, rather than bi-dimensional. They arise, unconsciously, from moods, and suddenly, rather than from plotting and planning. I do not think it rash, therefore, to say that the art that survives is a derivative of the co-conscious and the sub-conscious, and not something that came when bidden.

25. One word on the psychology of *song*. When a composer plans to set words to music, or music to words, as is sometimes done, there is often plainly manifest a marked discrepancy between them, if exhibited independently. For while a set of stanzas, for example, changes its subject matter, grammatical form, and significant punctuation, so far as correlating each line in every stanza is concerned, the music which usually goes with it is uniform for them all. As a result, there are discrepancies which must not reach the threshold of focality, for if they do, the harmonious state of mind will be upset, and the art commence to evaporate. For art and beauty are present by virtue of their con-

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tributing elements, and when the elements are disturbed, the beauty is not there,—it ceases to be. If any one asks where it goes, the answer is that its position is implicit in the complex, and when this has no coherence, the beauty ceases. It does not *go*, not being in the dimension of things that travel,—art being another instance of “only when,”—and not a case of something mysterious and hidden. Even in a famous song, the beauty present is present by virtue of there being a preponderance of co-consciously functioned pattern, despite the inevitable lack of co-ordination between the grammatical elements and the rhythms of the music. On the other hand, the sentimental and so-called “favorite” songs are examples of crowd consciousness, and their incoherent character points to something in their origin which cannot be art. In such a case, moreover, one can correlate the musical preferences of the organism with its preference for something that merely superficially satisfies. For the popular notion that music must make one weep in order for it to be choice, has many common parts with serious abnormalities.

26. In connection with the space arts, let us only consider what is meant by an artistic space, or beauty in the visual content. Con-

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sciousness being one with its object, one is permitted to speak not only of "a musical song," or "a musical performer," but "a musical consciousness" as well. It is the same with the other arts. We *beautify* a room, for instance, and this operation consists in making the space relations between the objects harmonize. Thus far, simple enough; and language here promises much. But what *is* the beautifying of a room, or the harmonization of spaces? Omitting the norm, for the time being, let us say that the harmonious state of mind which is the goal of art, is the presentation of objects in such a way that (a) the center of reference will not be the observer, but the observed instead. Indeed, loss of self-consciousness is exactly what this means. The art object, to be brief, cannot be felt to be owned while it is felt to be beautiful. It is not "mine," nor "yours," nor "ours," but, if the rhetoric be permissible, *we are its*. (b) In the presence of such an object there will be no motor tendencies to do anything more than to preserve the situation in its original form. And (c) there will be a release of complexes in the presence of the situation, so that the latent-period of beauty, upon future presentations, will be shortened. Now in beautifying space, it is necessary that the fewest possible

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motor tendencies which disturb the equilibrium be present, and one of the ways this is accomplished is by balance and symmetry. Here again, something "new" enters in. Any figure, the less extended it is the better, but no matter how ungainly it is alone, will, if doubled on one of its axes, produce an effect of balance. Balance on the horizontal and vertical axis, nevertheless, will produce the most satisfying effect, and in many cases we can discover a threshold of harmony even here. For when a figure is doubled, there are balanced tendencies in the motor elements of vision, and through these the gateway to non-personal reference is reached.

27. Thus one factor in the beautifying of space is exhibited. Rhythms of space also serve the same effect. Rhythms of sound are in time, and as such cannot be exhibited all at once; while space-rhythm is *presto* in character, and the effects are those of fusion and summation, rather than of serial order in time, and sensational continuity. There is also another difference between these two types of rhythm. A row of columns in rhythm may contain far more members than a series of notes in music, and still be grasped in a pattern. For the most notes we ever grasp as a unit are five, or at the utmost six; while we may get rhythm out of twen-

ty columns, which in space are presented at once. Rhythms are not only possible in pillars of the same length, but are equally elicited from unequal lengths. The receding into space of the more distant columns toward a point not specifically indicated in the scheme, produces co-conscious elements which balance the filled with the unfilled space. Such co-conscious elements appear also in the framing of pictures, where the mathematical center of the canvas is not the center of the color and shape masses balanced within it. Indeed, for these two centers to coincide is atrocious.

28. Colors will balance as well as will figures. A small, dark color mass at one side of a picture can be brought into balance with a very much spread-out color mass on the opposite side,—intensities here functioning the effect. Needless to say, all of the attributes of sensation are elements in all forms of art, and their varied exhibitions often produce effects of surprising newness. Indeed, *centering* seems to be most subtle of all the artist's nuances, and by the varied framing of certain pictures, exceedingly varied balances and instabilities may be obtained. So unlimited is the color reservoir, and so delicate is the threshold of effects, that, if one asks whether there are any exhaust-

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ibles in art, the answer is in the negative. And be it finally noted, that the creative interest is largely co-conscious. Just as we have mentioned the fact that we know our voluntary acts only *after* they have occurred, so we know that we have created, or put together things to make a beautiful object, only *after* the plastic materials have left our hands for crystallization. As with the case of revising ideas for the printed page, so we find in art that our hands or voices have bettered our original plan; and this bettering is not accomplished except by non-self-consciousness,—that is, it is only attained by responding without personal reference to the stimulus.

29. Some passing mention must now be made of the psychology of the business world. Such things as advertising and selling imply the material self. Advertisements therefore exhibit permanent needs in such a manner that the readers of them will be induced to purchase. This implies more than mere interest or curiosity. It implies that motor manifestations shall transpire, with the result that the object shall be bought, and this requires that the operations of purchasing shall become focal. To bring this about, the feeling of one's lack must inhibit the wish to retain what one has already gotten, and

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this is the central factor in selling. Be it said, however, that psychology may be used either to protect the unwilling buyer or to further the aims of the man selling a useless article. Any matter engaging the social self is psychology: whether we enter a store willing to buy anything that attracts us, or whether we go determined to have nothing but the one small article that is in instant need,—these and all intermediate cases are examples of some feature in psychology, and our failure to recognize it as such is not complimentary. It may, however, not be systematic psychology, but only the psychology of inarticulate thinking; but even so, it follows all the laws which pertain to that special domain. The psychologist cannot, therefore, tell you in advance what will be a good advertisement, for that is determined only after the advertisement has brought business, and not before. But the psychologist can tell you why it was a good advertisement, for everything is equally analysable. It is thus seen that analysis and deduction are not necessarily functioned by the same protoplasm with equal or comparable success.

30. Selling is *argumenta ad hominem*. Business, while in general devised to supply personal and public needs, is yet so crowded

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by competition that profits become functions of needless accessories. Very little of the professional selling is addressed to persons who actually *need* the article. But the desire to have as much as others have, or to have better than others have, or to be the only one within a wide radius who possesses this or that prized article, is that which makes the salesman flourish. There is a literature today on advertising and selling, which unfortunately goes by the name "psychological," and which once promised to bankrupt everybody for the sake of the merchant. This literature is, fortunately, becoming decadent, for the reason that the general increase of appeals for sales has inhibited itself,—too much advertising, and too many "below cost" sales look suspicious. There is no need for letters six feet high for persons who still have to examine their change to see if they have lost any. Even at the present date, also, a well-known psychologist, and a gifted writer to boot, is preparing a book for the general public on "How to evade the salesman," or "How to see through the fallacy of advertisements," or some such title, and so the tide, even of psychology, is setting in against the inflated world of unnecessary buying and selling.

31. There is another matter in connection

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with the psychology of business which is somewhat in the balance today, in spite of the recognition of it as worthy and desirable. I refer to the so called "efficiency" work which such men as Taylor and Gilbreth have made almost national institutions. Efficiency work is time-, and motion-saving,—two things which very greatly interest the business man. It arose from the pressure which the labor unions brought to bear upon the large manufacturer, for, to the constantly decreasing hours of work, the utmost output is necessarily conjoined. It is as if the capitalist had said, "All right, work as short hours as you please, but you must work in the strictest pattern so long as you do work." And thus we have our motion studies, and our scientific management which eliminate the unfit by machinery. The psychological effect on the worker is various. In the first place, his motions are studied, and he is made to perform rigidly identical tasks, rather than random ones. He is thus perfected in the small thing he does rather than introduced to the whole pattern of the work he is furthering. Only time can show the full results of this, for while it seems to some to make him a mere machine, to others it seems to give him the satisfaction of becoming a specialist. In the second place, the condi-

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tions under which he works are studied by specialists who know much more than does he as to what are the best conditions under which he becomes most productive, (regardless of whether he "likes" the improvement or not). Moreover, some of his thinking is done for him better than he could do it alone. Our modern factories, no matter how much they may be said to crush the "soul" of the worker, are far cleaner and healthier than the workmen would have ever evolved alone, if left to think out improvements in after-hours, or while they were wasting motions and time. And lastly, the economic conditions which have made the modern factory what it is are evolutions, for the psychology of the crowd, as well as the psychology of general business have crystallized into this present form, and it is only due to the manners and minds of men that either the good or bad conditions of the present exist.

32. There are many other instances of psychology in every day affairs which could only have a smattering treatment in such an account as this. And so we shall omit them. Be it remembered, however, that whatever is human response to environment is material for psychology. He who has analytic insight will carry with him into every situation he meets,

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the ability to sort the data and see the trend of affairs, especially if he will add to that insight the knowledge afforded by a study of the science of psychology. That it is a science, one cannot safely deny. The only difference between it and the so-called physical and mathematical sciences is, that there are more instable variables in it than in the others. One can know the human mind as well as he can know the reactions of bases and acids, but he cannot predict human minds unless they are patterned in such a way as to plot a series with very few lost members. In this connection, let it be admitted that we are close to the realm of value, for when one becomes predictable, he functions the permanent, and in so doing gets a logical consciousness. Otherwise, of course, one is predictable only in the sense that he is independent, a case which also hints of value in the negative sense. In this sense, psychology is a narrow strip of existence, and as such seems curiously enigmatical until one learns to relax and allow it merely to be exhibited to him without a qualm. For all our knowledge is in the conscious cross-section, and this fact makes up for any apparent heterogeneity among those series we find in strict psychology to be unexpectedly prime to each other. For as we but func-

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tion the universe, and nothing else, all that is complete, incomplete, valuable and valueless, as well as permanent and non-permanent is primarily of non-personal reference, and exists independently of us, except insofar as it becomes content of consciousness. And knowing, or functioning, or mentioning any matter neither creates it nor alters its power or being.

